RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK
BRANCH OFFICES AT 375 OLD COLONY BUILDING, CHICAGO, AND QUEEN ANNE'S CHAMBERS, WESTMINSTER, LONDON

EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

OFFICERS.—In accordance with the law of the state of New York, the following announcement is made of the office of publication, at 83 Fulton St., New York, N.Y., and the names of the officers and editors of The Railroad Gazette:

OFFICERS:

W. H. BOARDMAN, *Prest. and Editor*
E. A. SIMMONS, *Vice-President*
RAY MORRIS, *Secretary*
R. S. CHISOLM, *Treas.*
I. B. RINES, *Cashier*
L. B. SHERMAN, *Western Manager*

EDITORS:

RAY MORRIS, *Managing Editor*
BRAMAN B. ADAMS
CHARLES H. FRY
FRANK W. KRAEGER
GEORGE L. FOWLER
HUGH RANKIN
BRADFORD BOARDMAN

CONTENTS

EDITORIAL:

Storing Coal Under Water 561
Stockholders' Protective Committees..... 561
A Decade of Traffic on the Pennsylvania 561
The Use and Misuse of Coal..... 562
Written Examinations on Train Rules... 562
Railroad Short-Term Notes 563
Train Accidents in March..... 563
Indiana Railroad Commissioners' Views.. 564
Delaware & Hudson Company 564
Delaware, Lackawanna & Western..... 567
New Publications 568

ILLUSTRATED:

New Automatic Block Signals on the Erie 570
The Washington, Baltimore & Annapolis.. 572
Special Shape Tool Steel 572
Two Freight Bills of 1858..... 573
The Source of Internal Tire Defects.... 576
Interborough-Metropolitan Organization.. 578
The Wreck of the Quebec Bridge..... 580
New Signals at Broad Street Station.... 583

CONTRIBUTIONS:

Rolling a Compound Rail Section..... 569
Record Steam Shovel Performance..... 569
Economy of Better Rails at Higher Cost. 569

MISCELLANEOUS:

French Railroads in 1905 and 1906..... 573
The Ocean Carrier 581
Foreign Railroad Notes:
Prussian Locomotive Performance...
Double Tracking the Trans-Siberian. 572
Failure of the "Technolexikon".....
Chinese Railroads. 573

GENERAL NEWS SECTION:

Notes 585
Interstate Commerce Commission Rulings 588
Trade Catalogues 588
Obituary 589
Meetings and Announcements 589
Elections and Appointments 589
Locomotive Building 590
Car Building 590
Railroad Structures 590
Railroad Construction 590
Railroad Corporation News 591

VOL. XLIV., No. 17. FRIDAY, APRIL 24, 1908.

Some of the advantages of storing coal under water were referred to briefly in these columns on February 14. Since that time Bulletin No. 17 of the Engineering Experiment Station of the University of Illinois on "The Weathering of Coal" has been issued. According to the authors of this pamphlet, information concerning the behavior of coal in any sort of storage is very meager and there is much disagreement between recorded facts. These studies were made therefore to get a better understanding of all of the conditions attending the storage of coal in large quantities, such as weathering, spontaneous combustion, etc. Reference is made to the growing prominence of the under-water plan, and the studies of deterioration included samples maintained in a submerged condition, as well as in the open air, under cover at varying temperatures and in air-tight containers. The period covered by the experiments was nine months. The experiments were considered as being only preliminary in character, which would furnish information for more comprehensive and elaborate tests. They appeared, however, to justify certain conclusions. With reference to the submerged coal, it is stated that there is evidence of a distinct difference between this and the air-exposed. The values found for it during the nine months did not vary, with possibly one or two exceptions, by greater amounts than would occur in tests made on succeeding days by the same person. The coal was submerged in ordinary water at a temperature approximately 70 deg. F. The results showed that the processes which are active in air cease under water, these processes being the decomposition of the pyrites and the loss of volatile matter. This phenomenon suggested to the experimenters the idea of a displacement of hydrocarbon gases by oxygen, by some process akin to osmosis or catalysis, whereby a certain amount of oxidation of the carbon or hydrogen occurs. The results of the various experiments were considered of value both for what they revealed and for the suggestions for further studies which would yield fuller information on this important subject.

Stockholders of the Illinois Central living at Hartford, Conn., representing, it is said, some 10,000 shares, last week appointed a local committee to handle their proxies at future annual meetings of that corporation. The incident projects into sharper light the familiar infirmity of stockholders in great corporations. They are a host of disorganized units scattered far and wide through the land. They cannot attend meetings and, if they could and did, there wouldn't be a National convention hall large enough to hold them all. They do not and most of them cannot keep in touch with their own investments. Hence their proxies are duly signed and sent on or dropped in the waste-basket and the annual meeting of the big corporation usually resolves itself into a half dozen accidental stockholders at one end of the room and a president and secretary intrenched behind a huge pile of proxies at the other. This is the case when net earnings are good, dividends regular and the skies clear; and the stockholder only wakes up when calamity strikes in. Now and then there has been an exception. The late President C. P. Clark, of the New Haven company, used fitly to dub its annual gatherings "Town meetings"; but they ceased to be such when the annual free ride of his stockholders to the meeting was cancelled. The Hartford idea has perhaps a certain note of suggestion. It outlines as a kind of ideal ultimate the federating of stockholders into groups each with its representative committee and accents Aesop's fable of the collective strength of the bundle of sticks weak when single. But the idealism vanishes in the average temper and habit of the average shareholder. In his corporate relation he repeats the imbedded trait of the citizen whose civic ardor is a flash and not a flame. True, his investment touches directly the stockholder's pocket nerve. But does it more so than taxation? His treatment of his proxy is thus of much the same breed as his neglect of his party primary, and "committees of protection" in their various shapes will probably continue to be the fruit only of corporative disaster actual or feared—and a fruit not seldom harvested too late.

The record of the traffic and earnings of the whole Pennsylvania Railroad system for the last ten years presents some notable facts. This system, more than any other, benefits by the traffic of the primary iron industries, which in these ten years have had a phenomenal growth. These industries produce more weight per man employed than almost any other; and in fact the increase in freight traffic (ton-miles) of the Pennsylvania Railroad system was 130 per cent. from 1898 to 1907. But it is somewhat surprising to find that the increase in passenger traffic meanwhile was even greater—133 per cent. In the aggregate there was a considerable increase in the extent of the system, from 9,036 to 11,176 miles; yet, even so, the

traffic per mile of road increased 86½ per cent. in freight and 88¼ per cent. in passengers in the ten years. It may be said, however, that there was (and is) more room for the passenger traffic to grow. For every 100 passenger-miles there were 994 ton-miles in 1898, and 985 ton-miles in 1907, very nearly 10 ton-miles to every passenger-mile. For the whole railroad system of the United States in 1906 there were 857 ton-miles per 100 passenger-miles; on the New York Central in 1907, 594 ton-miles to 100 passenger-miles. That proportionally to freight the passenger traffic on the Pennsylvania is less than the average is not because the passenger traffic is light, but because the freight traffic is overwhelmingly heavy. The average for the whole country per mile of road was 982,401 ton-miles; on the New York Central (3,782 miles of road), 2,855,610; on the Pennsylvania system, 3,371,019 ton-miles. This helps to account for the fact that with slightly less than 5 per cent. of the total mileage of United States railroads, the Pennsylvania system had more than 14 per cent. of its gross earnings—$29,240 per mile, against an average of $10,460 for the country. Though, as we have seen, both passenger and freight traffic have grown greatly in the last ten years on this great system, and on the whole, one about as fast as the other, they have not grown evenly, by any means, and the passenger much more evenly than the freight. In the latter we have such yearly gains as 20 per cent. from 1898 to 1899, followed by 3.8 per cent. from 1899 to 1900 and a decrease of 2¼ per cent. from 1903 to 1904, followed by successive yearly increases of 17, 11.6 and 14.4 per cent., the latter from 1906 to 1907. In passenger traffic the increase did not vary greatly from 10 per cent. in 1899, 1900, 1902, 1906 and 1907; and in the year when there was a decrease of 2¼ per cent. in freight there was an increase of 3.6 per cent. in passenger traffic.

THE USE AND MISUSE OF COAL.

At a meeting of the American Society of Mechanical Engineers held on the evening of April 14, to discuss the subject of the conservation of our natural resources, Prof. W. F. M. Goss presented some rather startling figures regarding the utilization of the coal supply, figures that we all are more or less familiar with, but which need to be presented occasionally in order to drive home a realization of what is being done and what we must face if the present wastefulness continues. After reviewing the methods of mining in which the thin upper veins are neglected in order to first take out the better paying material from the thicker veins below, allowing the cover to become dislocated and rendering subsequent mining operations impossible in the upper strata, Dr. Goss showed how coal that has slate seams or is high in sulphur is left below, and how much otherwise valuable fuel is destroyed by heavy and injudicious blasting. He directed attention especially to the enormous quantity of coal used in modern locomotive service. Starting with an annual production in 1850 of between 50,000,000 and 60,000,000 tons, the output has more than doubled every decade since that time, until, in 1906, it reached an astounding total of something more than 400 million tons. Of this, nearly 120 million tons are burned in locomotives—more than the total annual output 25 years ago. That this consumption is carried on wastefully, and that there is a marked distinction between the practices of the United States and of Europe, was clearly shown. In Europe every possible effort is made to effect economies by the use of compounding or of superheaters, standing out in strong contrast with the practices of this country, where these means of saving are almost wholly disregarded, and emphasizing the distinction so often drawn, that Americans are prodigal of material and saving of labor, while the foreign engineer reverses this, clearly indicating where the source of greatest saving exists on the two continents, respectively. It is estimated that, by the use of superheaters and of a more rational system of burning the coal, a total saving of from 25 to 30 per cent. could be effected. This, with coal at $1.50 per ton, would mean an annual saving to the railroads of about $45,000,000. The figures are startling and it is useless to raise the cry, more or less sneering, that we have plenty of coal, and so what's the use of troubling ourselves. That there is a limit, no one can deny, although exhaustion does not stare us in the face this year or next, or in the next decade. But no matter how rich we may be, reckless extravagance is not the course of wisdom. Twenty-five years ago, when the Michigan lumber industry was at the height of its prosperity and when its pine controlled the markets of the world, there were a few conservative old fogies who protested against the rampant wastefulness, and predicted an early destruction of the forests and the extinction of the industry. But they were laughed at for their pains, and it was proven very conclusively by the mill men, to their own satisfaction, that the pine would last for a hundred years. So they continued to waste more than 25 per cent. of the log in sawdust and slabs, and to burn or leave behind all the tops and branches. Then, fifteen years later, they closed their mills, or burned them for their insurance, and Michigan pine was a thing of the past. The great, primeval forests had been obliterated, and in their place we have wide expanses of denuded sand flats, barren and useless.

Lest we should forget this warning, so recently given, the movement now on foot to conserve our natural resources in timber, coal and ore, was originated. Surely no industry has a more vital interest in the matter than have the railroads, despite the apparently reckless manner in which they consider the subject of coal economies or refuse to consider it, unless it can be demonstrated to them by an incontrovertible Q. E. D. that they can save a dollar to-morrow by taking action to-day, on the principle of a quick return and big profits. There is such a thing as making provision for the more remote future, and one of the oldest and most familiar of the means to this end lies in the preservation of the things we have now in hand.

WRITTEN EXAMINATIONS ON TRAIN RULES.

The Aurora, Elgin & Chicago, an electric interurban road, recently adopted a plan for written examinations of trainmen on its rules and regulations. We understand that this is the first interurban road to follow this plan, and the suggestion has been made that the idea is one the steam roads might do well to adopt. While oral examinations are almost universal with the steam roads, the idea of written examinations is far from novel. The Chicago & North-Western has been requiring written examinations for six years—ever since the present book of rules has been in effect. The system of questions is most complete, there being a separate set of questions for each class of employees who must be familiar with the rules in part or in whole. Each set of questions is bound in pamphlet form, 8 in. x 10½ in. For conductors there are 384 questions; for enginemen, 347; train despatchers, 175; agents and operators, 170; brakemen and baggagemen, 143; yardmasters and switchmen, 74; track, bridge and building foremen, 61; signalmen at interlocking plants, 53; firemen, 48. Agents also have an additional list of 228 questions on accounting rules. Space is provided at the end of each set of questions for any additional questions the examiner may care to ask.

Before the present rules became effective, an examining board was appointed and all employees were given a written examination thereon. There are no periodic re-examinations, but the rules are now being revised to conform to recent changes in the Standard Code, and all employees will again be examined. The examination papers are numbered and filed in the superintendent's office. Once a month the list is checked over to see that all changes have been properly entered. At the end of each quarter the papers of men who have left the division are removed from the file and stored away. Occasionally a man from the general superintendent's office goes over the road and checks up the superintendents. Men taking the examination must answer all questions. If the examiner, in looking over the papers, finds answers to questions which give the impression that the man has not understood the matter clearly, he is called in and questioned, and either allowed to revise his answer or is required to study up on these points and answer the questions again later, as the examiner may decide. If a man fails on the first examination he is allowed to try again within 60 days. In the event of a second failure a final chance is given him within six months.

A good many advantages are claimed by the North-Western for this system as compared with oral examinations. First of all, it is systematic and thorough. The questions are formulated to cover all the rules. In oral examinations no one person in a class will be questioned on all the rules even should the class as a whole be asked regarding every rule. The fact that the written answers are a record for reference at any time is equally important. If a man violates a rule he is unable to plead that he was not asked about it in the examination and did not understand it properly. Furthermore, many men are nervous in oral examinations and may make an unfavorable showing, when in reality they may be sound on the rules. In the written examinations they have all the time they want. If a man is in doubt about the meaning of a question, the examiner is there to explain it and give such help as is permissible. At the

same time, the opportunity for displaying partiality is minimized. A further important advantage of the written method is that it assures a uniform understanding of the rules and eliminates variations in interpretation of the rules due to changes in examiners. Naturally an examiner interprets the rules as he personally understands them, and no two men may put exactly the same construction on them. An employee brought up on a certain division and instructed and examined by a certain officer, will interpret the rules accordingly. But examiners change, and employees are constantly changing from one division or district to another, and are thus coming in contact with examiners and employees whose education in the rules probably has been somewhat different. With the written examinations the viewpoint is the same for all.

A number of roads have considered written examinations, but the majority believe oral examinations much better and more satisfactory. We understand that the Rock Island is preparing to adopt the written plan. The Southern Pacific used written and oral examinations for a time; that is, the employee would first answer certain questions in writing and then would be questioned orally afterward to ascertain his understanding of the rules. At present the examinations are largely oral, for the reasons given at the beginning of this paragraph.

The Aurora, Elgin & Chicago has 234 questions on its list. They are printed on loose sheets about the size of the North-Western's pamphlet. All trainmen must be re-examined once each year. The passing grade is 95 per cent. In case of failure the first time, another trial is allowed within two weeks. A second failure in the case of men already employed results in suspension from the service. Of the 234 questions, 41 are on the air brake, and are therefore only for motormen, or candidates for that position.

THE RAILROAD SHORT TERM NOTE

Speaking in a very general and somewhat rough way, borrowers of money from banks and trust companies may be divided into three groups. There is the borrower of high standing and credit, either in business or out of it, who borrows on the strength of an individual name or names. There is the borrower—the "commercial" borrower—who obtains his loan on the commercial bill payable, as collateral security; and, finally, there is the borrower on stock, bonds, realty or other securities, usually solid, of the same general kind. In the borrowing of funds by railroad corporations one finds similar analogies. The short term note may be said to represent single name paper. It shifts to a kind of commercial paper when it becomes partly secured either by future potential mortgage power or more immediately by collateral which is apt to be of uncertain quality; and, finally, in the shape of the senior railroad mortgage or the junior mortgage of a prosperous railroad corporation we have the analogue of the bank loan well secured by first-class collateral in stocks or bonds.

The panic period which struck the nation six months ago had been preceded by a somewhat longer period of rising investment rates seriously affecting the borrowing power of corporations, especially the railroads. During that earlier period of a year or more it was not so much a case where credit was shaken as of actual exhaustion of investment funds owing to great loans of big railroad corporations. "Prosperity" then of uncertain endurance had overloaded them. There was shortage of cars, public outcry over detained freight, complaints of inadequate switching yards and terminals, steps toward and to reciprocal demurrage, saying nothing of more overt anti-railroad legislation actual or threatened. Not many railroad financiers or managers were prescient or saw the storm ahead just beginning to lift over the far railroad horizon, and investors were, with few exceptions, in the same mental condition. Railroad improvements seemed and were, for the time, imperative, and the high interest rate was deemed but a temporary strain. Hence the "short term note" policy adopted as a transitory expedient of bridging what looked like a narrow gap and hence also the sequel of that policy in a huge volume issued of that class of security. At first, in competition with an ordinary mortgage investment rate of 4 per cent., the short-term railroad note found a market on a 5 per cent. basis, which increasing money stringency ere long forced up to 6 per cent. Most of the better class of notes now outstanding are at the former rate; but out of 32 such issues 23 become due during the coming two years; and the experience of the Erie in its crisis just past suggests the problem ahead for some of the weaker lines.

Pessimists are now drawing somber horoscopes on the future of the railroad short note which, indeed, has become a very important element in the railroad situation on its fiscal side. They point out the great volume of those notes, their early maturity, their character as a note of hand of a railroad corporation, often unsecured, and the existing shadow on the net earnings which are the basic test of a railroad's borrowing strength, and they point to the Erie episode as the precedent and prophecy of trouble ahead when the short notes mature. The prognosis has its savor of reality, and if hard times lengthen and deepen overmuch may, in some cases, be fulfilled. But the reassuring argument is much the stronger. The railroad short notes are many in number, great in mass and diverse in terms. But in general they have been issued by strong corporations with large equities in dividends even if the dividends are reduced. A great proportion of them can be renewed even though a 6 per cent. note replaces a 5 per cent. one; and, when paid, they release just that amount of money for reinvestment—a trite fact, but one apt to be forgotten. Another point likely to be overlooked is the present-day saving power of capital when held in powerful hands of the individual. That massing of capital under single control has its palpable dangers when the individual is speculative and unscrupulous. But one of its good sides is its protective force in a corporation's crisis where a host of stockholders or even a body of directors cannot act with either effectiveness or promptitude. The Erie case itself is a vivid illustration. In 1873 and the few years following a road in the plight of the Erie would inevitably have gone through bankruptcy, and so late as 1895 the Erie practically did so under the form of stock assessments. It is now, for the time being at least, saved by individual action and resources which seem likely to be used hereafter in the case of other embarrassed big lines even should the hard railroad times protract into a "long drag."

Another feature of the interesting and important short note situation calls for attention. The holder of a short note of a perfectly solvent railroad corporation has, so long as the corporation is absolutely solvent, what amounts to a mortgage security. Using an outside illustration, A holds B's note of hand. A knows that B holds a profitable business block worth say $50,000, but carrying a first mortgage of $10,000, a second mortgage of the same amount, and thus with an equity of $30,000 which at forced sale would be but slightly reduced. The judgment against the equity, in case of default on the note, is in such a case ample security for A. His peril is in B's possible addition of a third mortgage or extension of liabilities in other directions, among which A must take his chance. Substitute for A the holder of the short term railroad note and for B the railroad corporation and the peril at once becomes obvious. The instant any railroad corporation begins to impair the equities that secure its note of hand that note becomes shady and a single grave instance of the kind affects that security as a class. The temptation to such a policy is plain enough. The weak railroad corporation is led to it as an ultimate resort to prevent a receivership, the solvent company is tempted by the prospect of securing a loan at a lower interest rate. As a broad and general policy, therefore, the policy of the railroad corporation should be the conservation of the equities which secure the short note. It may sometimes be difficult, but it is the price to be paid if the short note is to be renewed, if the whole structure of short note credit is not to be roughly shaken and if new crises of the Erie type are not to ensue without the Erie solution. In the short note matter, as well as in other railroad affairs during the present stress, wisdom points toward fore-thoughtful conservatism. That the notes happen to be "short" thus compelling, in a sense, that policy of conservatism as a condition of payment or renewal is perhaps a benign ultimate fact for the railroad companies as well as for the investing public. Had the notes been "long" though the fiscal strain would be relaxed, the inducement to immediate prudence would be relaxed also.

Train Accidents in March.

In March as in February the number of train accidents occurring in the United States which were of sufficient magnitude to come within the definition of "serious," as used in this column, was very small. But, though the number is small, there need be no fear that the full record of the month will lack variety, nor is there any warrant for relaxation of effort to provide safer service. It is gratifying to be able to record diminishing lists of deaths and injuries, and we shall hope to see still further improvement, but the losses of property in collisions and derailments will continue to aggregate large sums, we may be sure. Three of the collisions shown in the present list appear from the newspaper accounts to have been due to mistakes in giving or understanding telegraphic orders, showing that the expense of maintaining the

block system is still grudged by some roads. And these are roads which know the value of the system, too. The worst accident in March, the derailment at Bristow, Oklahoma, causing the deaths of a mail clerk, a fireman and a trespasser, was caused by a large iron nut which had been placed on the rail. The front part of the train fell through a high trestle. It was running fast, but the passenger car that was wrecked carried few passengers, which accounts in part for small number of injuries. How the nut came on the rail is not known, and we have classed the accident as due to "malicious obstruction."

Train Accidents in the United States in March, 1908.[1]

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
20.	Boston & Maine	Haverhill, N.H.	bc.	Ft. & Ft.	4	1
24.	Chic., N. O. & T. P.	Burgin.	bc.	P. & Ft.	0	11
24.	Illinois Central	So. Memphis.	xc.	Ft. & Ft.	1	5
*27.	Erie	Belvidere.	bc.	Ft. & Ft.	2	4
29.	Lehigh & Hud. River.	Eastchester.	bc.	Ft. & Ft.	1	2

Derailments.

Date.	Road.	Place.	Kind of train.	Cause of derlmt.	No. persons reported Kil'd.	Inj'd.
7.	Chic., Burl. & Q.	Kearney.	Pass.	dr.	0	4
†14.	St. L. & San Fran.	Bristow.	Pass.	malice.	3	7
19.	I. & G. N.	Pearsall.	Pass.	b. rail.	1	8

Other Accidents

*22.	Delaware & Hudson	Schenevus.	Ft.	boiler.	3	0

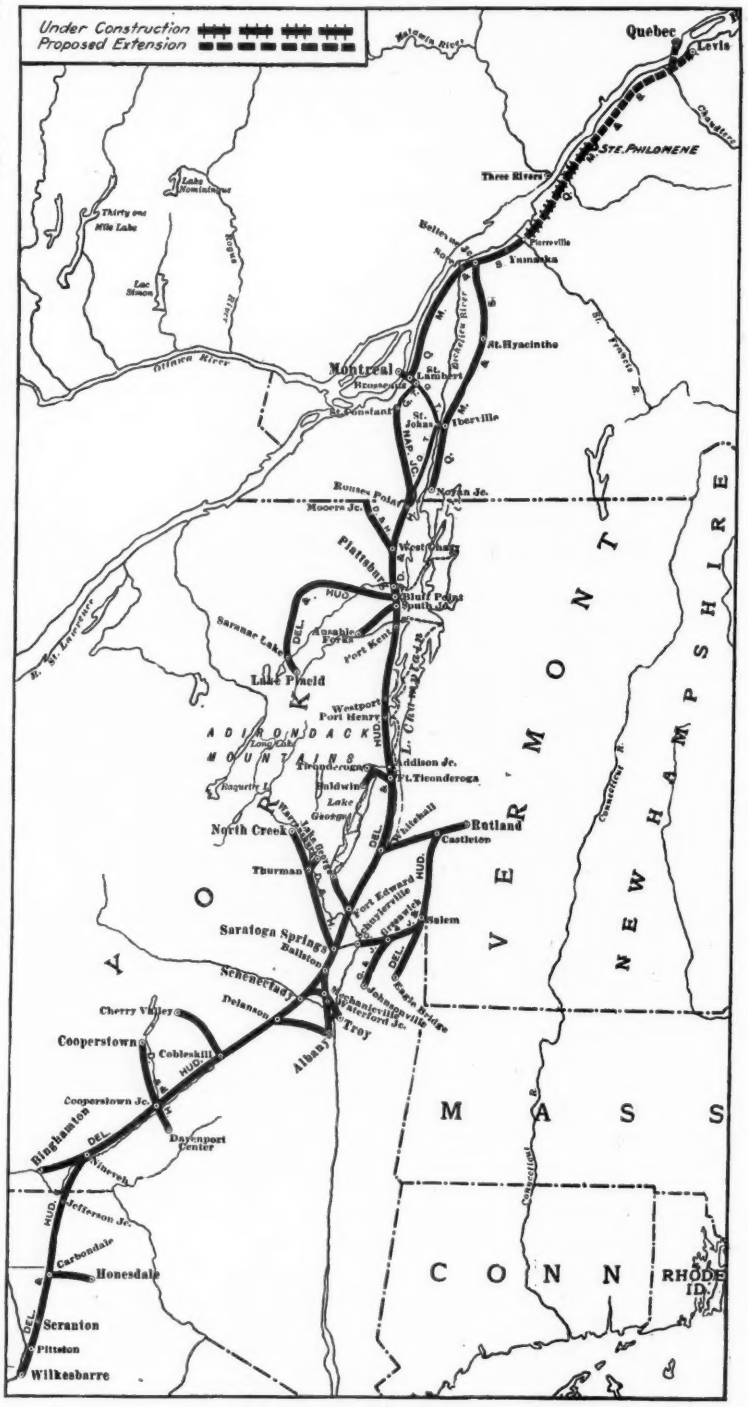
Of the few electric car accidents reported in the newspapers as occurring in the month of March, none had fatal results, so far as we have observed, though one derailment (in Detroit, Mich., on the 24th) resulted in the injury of 20 persons, besides as many more who sustained minor hurts. A car running about 25 miles an hour was derailed (by a defect in the track, it is said) and it ran into and demolished the front of a two-story building.

It must be remembered that no one has the least semblance of right to use a railroad as a public footpath or sidewalk. This salutary truth appears in Accident Bulletin No. 1, which has been issued by the State Railroad Commission of Indiana. It is not a novel declaration of truth, but it is especially welcome, coming, as it does, from an official body in one of those states where the lawless use of railroad rights-of-way has been glaringly common. People who have walked on the track all their lives and who deem the privilege a right, are not going to be subdued easily; but correction must come, some time, and it is well that a vigorous and authoritative warning should be sounded. The Indiana commission has issued two quarterly accident bulletins, which together cover the half year ending December 31, 1907. The statistics are not well arranged, and the commission has secured little or no useful information concerning the causes of the accidents reported, but the observations offered in the report show a commendable spirit. Attention is called to the fact that highway crossings, at which 28 persons were killed in the first three months, within the state of Indiana, are now in many cases more dangerous than formerly, because interurban electric railroads are laid parallel to the older steam roads, so that wayfarers have to cross two railroads practically at the same moment. The commissioners hear that enginemen do not sound the whistles for highways as clearly and regularly as they should, and they are going to issue a circular calling attention to the penalties prescribed by law for neglect to whistle, emphasizing the statement with a record of the number of deaths which have occurred at crossings. It is well that the engineman should be called to account in this matter, but it is to be hoped that the commissioners are not innocent enough to believe that a correction of this fault will have much effect in reducing the number of casualties at crossings. The first bulletin calls attention to the fact that in small towns the telegraph office, or the signal tower, often is made the village loafing place, though the rules of the railroads forbid it. It is suggested that the city and town police authorities ought to correct this bad practice.

[1] Abbreviations and marks used in Accident List:
rc.....Rear collision.
bc.....Butting collision.
xc.....Other collisions; as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b.....Broken.
d.....Defective.
dr.....Defect of roadway.
eq.....Defect in car or engine.
n .....Negligence.
unf.....Unforeseen obstruction.
unx.....Unexplained.
derail.....Open derailing switch (negligence of engineman or signalman).
ms.....Misplaced switch.
acc. obst..Accidental obstruction.
malice....Malicious obstruction of track or misplacement of switch.
boiler.....Explosion of boiler of locomotive on road.
fire.....Cars burned while running.
Pass.....Passenger train.
Ft.....Freight train (includes empty engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

Delaware & Hudson Company.

The seventy-eighth annual report of the Delaware & Hudson Company has many points of difference from the company's previous statements. It reflects in many ways the new management of the property. The gross and net earnings and the net income are no longer given by divisions, nor are the assets and liabilities described in as great detail as formerly. On the other hand, more operating statistics, such as those for locomotive mileage and its cost, and home and foreign freight car mileage, are given. A new table shows the tonnage of different commodities carried during the years 1900 to 1907, inclusive. Over half of the 70 pages of the report are taken up with a description of the steam and electric



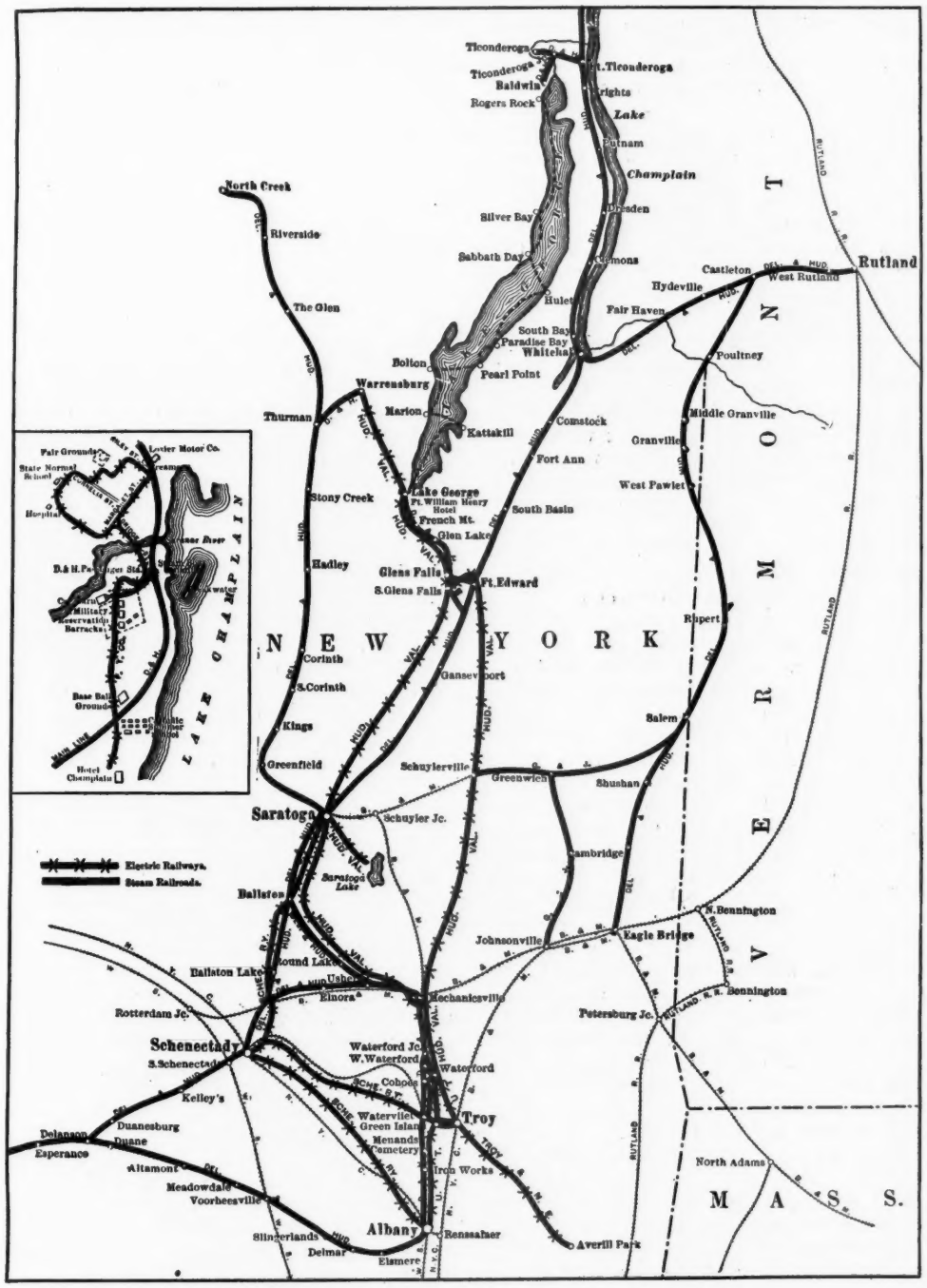
Delaware & Hudson Steam Lines.

railroads acquired during the last two years. The new coal properties during that time acquired are also described in detail.

The year was one of great activity in the company's operation. Its collieries and washeries were operated to their full capacity throughout the year, producing 6,600,000 tons of anthracite coal out of a total anthracite production of 67,100,000 tons. At the same time the railroad lines handled a much larger traffic than during any previous year. Gross railroad earnings increased 18 per cent., from $17,100,000 in 1906, the previous high record figure, to $20,200,000. The increase came largely in coal freight earnings, which rose from $6,700,000 in 1906 to $9,100,000 last year, an increase of 36 per cent. Merchandise freight earnings increased 8 per cent., and passenger earnings, 5 per cent.

Against the increase of $3,100,000 in gross earnings there was

a rise of $1,500,000 in operating expenses. Of this increase, maintenance of way was responsible for $448,000, maintenance of equipment for $320,000, and conducting transportation for $723,000. The increased cost of operation was due both to the larger amount of traffic and the increased cost of materials and labor. The year marked the culmination of advances in prices of material that began in the fall of 1905. There was an increase in the price of ties in 1907 over 1906, ranging from 11 to 13 per cent.; of finished products of iron and steel, such as axles, gray iron castings, steel castings and malleable castings, from 12 to 20 per cent., while the prices of copper wire, brass castings, journal bearings, Babbitt metal and other material in which copper enters largely, increased approximately 22 per cent. The cost of miscellaneous supplies increased from 2 to 3 per cent. At the same time, in common with other railroads, the rates of pay in almost all branches of the



Electric Railway Properties of the Delaware & Hudson.

track, shop, engine, train and yard service were increased during the early part of the year, the total increase being equal to about 7 per cent. of the aggregate pay roll. Yet net railroad earnings were $8,400,000, against $6,800,000 in 1906.

Gross receipts of the coal department increased $4,600,000, or 25 per cent., but operating expenses increased a little more than this amount, so that net earnings of the coal department were $36,000 less than in 1906, being just under $1,200,000. The combined net earnings of the railroad and coal departments, therefore, were $9,600,000. To this must be added $1,500,000 of other income, making a total fund of a little more than $11,000,000 from which to pay taxes, fixed charges and dividends, this being an increase of $1,700,000 over the similar amount available in the previous year.

Fixed charges were $500,000 larger than in 1906, chiefly because of interest payments on the new $10,000,000 first lien 15-year 4½ per cent. equipment bonds dated July 1, 1907, and a full year's interest on the debentures of 1906. Net income was $6,500,000, which is equal to 15.25 per cent. on the outstanding capital stock, against $5,200,000 in 1906, or 12.28 per cent. on the stock. Lacking the "general profit and loss" account it is not possible to follow the disposition of this net income in 1907. The company reports a surplus for the year, that is, an increase in the amount to the credit of profit and loss, of $3,025,218. There was paid in dividends $3,816,000 (9 per cent. on $42,400,000), which, subtracted from net income leaves $2,650,173 surplus for the year, as shown in the table at the end of this review. No information whatever is given as to the charges to income (general profit and loss) for improvements in 1907 but from this showing it would appear that no such charges were made. The income account for 1906 has been similarly rearranged, as is explained in detail in the table, and it shows a deficit of $691,212, as against a reported surplus in that year of $493,801.

Maintenance of way expenditures per mile operated were considerably higher last year than in 1906. Unit maintenance of equipment expenditures were lower, as was naturally to be expected, because a large amount of new equipment was bought. Maintenance of way per mile cost $2,171, against $1,648 in 1906. "Expenditures on account of railroad department construction," amounting to $3,400,000, were charged to capital account. Repairs of equipment cost $1,907 per locomotive, against $1,917 in 1906; $303 per passenger car, against $311 in 1906, and $44 per freight car, against $55 in 1906. There were 53 locomotives, 48 passenger cars, and 7,678 freight cars added to the equipment during the year. Railroad equipment account on the balance sheet was increased $10,300,000. In December, 1907, an appraisement of the equipment of the company was made by a mechanical engineer who was until recently superintendent of motive power of one of the trunk lines. He spent five weeks in and about the various shops and yards personally inspecting a sufficient number of locomotives and cars in each class and series to give an accurate idea of the general average condition of the equipment. He reported that all classes of equipment were well maintained, and estimated the aggregate value on December 31, 1907, at $25,563,798, which exceeds by $598,295 the amount at which the equipment is carried in the accounts.

Freight earnings increased $3,000,000, or 22 per cent., and freight density from 2,550,000 to 2,970,000 tons one mile per mile of road. The ton mile rate rose from 6.33 mills to 6.6 mills, but this was largely due to a change in accounting. The practice of crediting to earnings a nominal rate per ton mile lower than the average rate for commercial freight, and charging to expenses an equal amount for the transportation of company material was discontinued on September 1, 1907. The practice necessitated considerable extra work by station and accounting forces, with no increase in net revenues. The train load was 452 tons, against 460 tons in 1906, and 455 tons in 1905. The average number of tons per loaded car, however, increased from 24.27 tons to 25.55 tons. The freight earnings per revenue train-mile were $2.99, against $2.93 in 1906.

The following table shows in percentages the proportion of the various commodity groups to the total freight tonnage during the last eight years:

	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
Agricultural products	9.63	6.10	6.97	5.84	5.82	5.03	5.51	4.47
Animal products	1.09	.97	1.12	.83	1.26	1.35	1.43	1.22
Mineral products	65.79	68.78	60.46	70.38	67.15	68.12	65.16	68.39
Forest products	4.20	5.35	6.69	4.59	4.74	4.31	4.66	4.52
Manufactures	12.69	12.07	15.72	12.42	12.84	13.00	15.18	13.57
Merchandise	1.68	1.79	2.15	1.24	1.75	2.10	2.02	1.79
Miscellaneous	4.92	4.94	6.89	4.70	6.44	6.09	6.04	6.04

The two largest increases during the year were in anthracite and bituminous coal. The increased tonnage of the latter product, which does not originate on the Delaware & Hudson lines, suggests that the interchange business with the Pennsylvania at South Wilkesbarre increased during the year, and that the Delaware &

Hudson is becoming more important as a through route for carriage of bituminous coal from the Pennsylvania fields to the Albany, Adirondack and New England territory. The other principal increases of more than 50,000 tons in descending order of tonnage were: ores, miscellaneous, stone, etc., lumber and grain. There were three decreases of over 50,000 tons: rails, 133,000 tons; other mill products, 54,000 tons, and flour, 53,000 tons.

Important additions and betterments were made during the year. There were built five miles of new second track, 17 miles of third track, and 16 miles of fourth track, a total of 38 miles of new additional tracks, besides 51 miles of sidings. These included a third and fourth track between Ballston, N. Y., and Saratoga, which was electrified and is now being operated by the Schenectady Railway and the Hudson Valley Railway jointly. They also include third and fourth tracks from Green Ridge, just north of Scranton, Pa., north to Carbondale, a part of the line where coal, merchandise and passenger traffic is dense. Construction of second track between Watervliet, N. Y., and Waterford Junction is nearly finished. This line carries the heaviest passenger business of the company, amounting in summer to over 60 trains a day. The construction of second track between Delanson, N. Y., and Schenectady, including improvement of grades and alinement, is also nearly finished. All the northbound coal traffic and most of the merchandise traffic pass over this section of the road. This new second track will have a maximum and substantially uniform grade of 45 ft. to the mile southbound. Much expense for pusher engines will be done away with and an increase in the trainload will be possible, as well as a relief of the congestion of this strip, which has often hampered the rapidity of operation of the connecting sections. During the year, 45 miles of single track and 111 miles of double track were equipped with automatic block signals. Except for 25 miles between Rouse's Point and Plattsburg, the whole main line is now so equipped, also the Lake George branch, the Schenectady and Delanson branch, and the Schenectady and Mechanicville branch, a total of 408 miles of line, of which 177 miles is single track and 231 miles has two, three or four tracks. The work of grade crossing elimination at Schenectady has been finished, and the new union station, which is used jointly with the New York Central, was recently opened.

For the past year or more the Delaware & Hudson has been under fire from certain stockholders who have made general allegations of mismanagement and particular criticisms of recent purchases of steam and electric railways and of coal lands. In answer to the particular criticisms of recent purchases, the company devotes over half the report to a detailed description of the new properties and the reasons for buying them.

First, in regard to the new coal lands, President Loree states that it has been the company's policy for many years to acquire coal lands as opportunity offered. So far as could be ascertained there were no available tracts in the Lackawanna or the Wyoming valleys. The only tracts which could be found were in Schuylkill county, Pa., which is south of Wilkesbarre and is not now reached by the Delaware & Hudson lines. Here nine tracts were acquired, which are named and each described. They include 2,434 acres of surface area and 3,461 acres of coal land area, with an estimated mineable tonnage of 423,265,353 tons of coal. It was estimated that on December 31, 1904, the unmined tonnage of the Delaware & Hudson amounted to 218,644,286 tons, and mining has been going on rapidly since that time. It can easily be seen, therefore, that the new coal lands are a large and substantial reserve for the company to fall back upon as its previously owned supplies become exhausted. The total cost of the new properties was $5,219,850, which amounts to 1.23 cents per estimated mineable ton. These new properties are owned by the Schuylkill Coal & Iron Company and the Shanferoke Coal Company, all of the stock of both of which is owned by the Hudson Coal Company, all of the stock of which is owned by the Delaware & Hudson.

Each of the new railroad properties which has been bought is described in detail, with a separate map, a chart showing earnings, and a description of its organization, property, mileage and traffic with, in the case of the electric roads, information under the additional heads of population and franchises.

Of the steam railroads bought, the largest is the Quebec, Montreal & Southern, which, as shown on the accompanying map, runs from Noyan Junction, at the northern end of Lake Champlain, and also from Montreal, to Pierreville on the St. Lawrence river below Montreal. From here an extension, which is to be finished about July 1, is being built to Ste. Philomene, 48½ miles. Eventually the line is to be extended to Levis and across the river to Quebec. Including the extension now under construction, the Quebec, Montreal & Southern has 206 miles of line. This road was bought "for the purpose of protecting the supply of pulp wood necessary for the continued operation and enlargement of the paper mills already located along the line of the Delaware & Hudson." The extension now building will draw supplies of wood both from the Lotbiniere & Megantic Railroad at St. Philomene and also from the northern side of the St. Lawrence by floats, thus tapping the great pulp supplies of that northern country. The line when finished to Quebec will also be, in connection with the Delaware & Hudson to Albany, and the New York Central from Albany to New York, the shortest line between Quebec and New York. As an unimportant local road the Quebec, Montreal & Southern is now earning a little over operating expenses, and the new extension should bring a large increase in earnings and in profits. Its gross earnings in 1907 were about $300,000. It is evident that the acquisition of this road was largely a protective measure. An estimate is given showing the total revenue of the Delaware & Hudson from the paper mill industry to be $2,800,000 a year. Unless the raw material supply of these manufacturers is protected their traffic cannot be retained by the road.

The Napierville Junction Railway, the second of the new properties, was organized to build a connecting line from the United States boundary one mile north of Rouse's Point, N. Y., to St. Constant, Que., 27 miles. St. Constant is about 20 miles southwest of Montreal. This connection from Rouse's Point to St. Constant has now been built, and negotiations are under way for trackage rights over the Grand Trunk from St. Constant to Montreal.

The Greenwich & Johnsonville runs from Johnsonville, Washington county, N. Y., on the Fitchburg division of the Boston & Maine, north to Greenwich, and from Greenwich, both east to Salem on the Rutland branch of the Delaware & Hudson, and west to Schuylerville on the Hudson Valley (electric) Railway, a total of 34 miles. In 1907 it had gross earnings of about $95,000 and net earnings of about $40,000. It runs through a farming country and there are about 20 manufacturing industries on the line, with numerous possibilities for further industrial development.

The electric roads controlled by the Delaware & Hudson are shown in the map on page 565, which also includes the Delaware & Hudson steam lines in their vicinity. The two services supplement each other in passenger service. President Loree states that the net income of all the electric lines controlled by the Delaware & Hudson is equivalent to a little over 4 per cent. on their cost. Returns on the Hudson Valley are only 3 per cent., but measures are actively under way to increase earnings and reduce expenses on this property, and it is believed that these results can be materially improved.

The United Traction Company operates the street railway service at Albany, Rensselaer, Watervliet, Troy, Lansingburg, Green Island, Cohoes and Waterford, N. Y., and maintains interurban service between these places, carrying freight and express as well as passengers. Its gross earnings in 1907 were about $2,000,000, and its net earnings about $900,000. By its ownership of the local lines it controls the entrance of other electric lines into Albany and Troy. The Albany & Hudson, the Schenectady Railway, and the Hudson Valley all have contracts for use of its tracks. It is evident that it is by far the most profitable of the Delaware & Hudson's electric railways.

The Hudson Valley Railway runs from Waterford, N. Y., from which it has entrance into Troy over the tracks of the United Traction Company, north to Warrensburg. Between Mechanicville and Glens Falls it has two lines, one via Schuylerville, the other via Saratoga. The Saratoga line is not continuous, but passengers have to walk across Broadway, in that city. The mileage operated, including short branches, is 127 miles, of which five miles is trackage rights of the United Traction Company, and six miles, Delaware & Hudson trackage. The company owns the Warren County Light, Heat & Power Company, which has valuable franchises for transmitting power across country which could not be acquired by an electric railway, the Fort William Henry Hotel and Park on the southern end of Lake George, and two other amusement parks. In 1903 its gross earnings were about $295,000 and its net earnings about $20,000. Last year its gross earnings were about $625,000 and its net earnings about $230,000.

The Schenectady Railway is owned by the Delaware & Hudson and the New York Central & Hudson River jointly, the New York Central interest being held by the Mohawk Valley Company. It owns the local street railway system of Schenectady and lines from Schenectady to Albany, from Schenectady to Troy, and from Schenectady to Saratoga, of which the Schenectady to Albany line is a strong competitor for passenger service of the main line of the New York Central. It gives the Fonda, Johnstown & Gloversville an entrance into Schenectady. It does a profitable package express business. Its gross earnings in 1907 were about $1,120,000, and its net earnings about $260,000.

The Troy & New England operates an unimportant electric line from Albion, a suburb of Troy, to Averill Park, a new "real estate" suburb further out. At Albion it connects with the United Traction Company. In 1907 its gross earnings were about $32,000 and its net earnings about $7,000. Its main value to the Delaware & Hudson is potential. It was chartered to build a line from Troy to State Line, Mass., and Pittsfield, on the Boston & Albany. This franchise would be valuable if the Delaware & Hudson should at any time desire to build a connection with the New York, New Haven & Hartford.

The Plattsburg Traction Company, which is shown separately on the map, operates eight miles of single-track electric line in the city of Plattsburg, N. Y., which has a population of about 10,000 people in addition to a large transient population. In the year ended June 30, 1907, its gross earnings were about $22,500 and its net earnings about $10,500.

It is evident that the various purchases of coal lands, railroads and electric railways recently made by the Delaware & Hudson are part of a policy of expansion. The value of most of them lies in the future rather than in the present. The report does not give the cost of these various properties, so that it is impossible to judge whether their probable value is commensurate with the price paid for them, but it would appear that each one of them is desirable in the future development of the company. Completion of the Canadian line will give the Delaware & Hudson shorter through lines to Canadian points and will protect sources of raw materials for one of its most important manufacturing industries. Ownership of the electric lines protects the most important local territory of the company. Ownership of the new coal lands insures a long extension of the most profitable part of the company's business. These purchases were made previous to the connection of Mr. Loree with the property; they are likely to be worked out to successful use under his direction.

In buying all these properties and making the various improvements mentioned, a considerable floating debt has been formed. Loans payable on December 31, 1907, amounted to $10,800,000, a new item, which did not appear on December 31, 1906. In order to meet these debts and other needs, the stockholders have been asked to authorize, on May 12, 1908, a first and refunding mortgage securing not more than $50,000,000 35-year (or longer) 4 per cent. bonds, the present issue of which is to be limited to $20,000,000. It is believed that these bonds will have a ready sale, for the credit of the Delaware & Hudson is high.

One of the strongest assets of the company at the present time is the fact that Mr. Loree is its president. His genius for railroad management has already been shown on the Delaware & Hudson, not only in the fine results obtained during the trying year of 1907, but by the monthly reports of earnings since the close of that year. The Delaware & Hudson is one of the very few roads to report increases in both gross and net earnings for the months of January and February, the latest months for which returns have yet been issued.

The results of the last two years' operation, not including the lines in Canada or the electric lines, are summarized below:

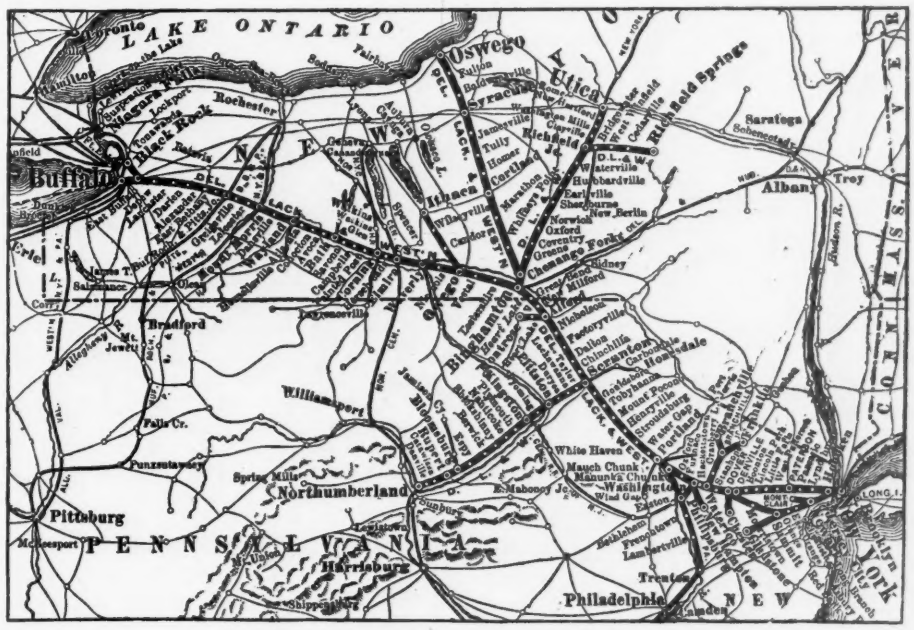
	1907.	1906.
Mileage worked	845	843
Passenger earnings	$2,945,408	$2,814,082
Coal freight earnings	9,081,664	6,665,732
Merchandise f't earnings.	7,533,169	6,949,898
Railroad gross earnings	20,175,794	17,050,029
Maint. way and structures	1,836,871	1,388,884
Maint. of equipment	2,336,273	2,016,386
Conducting transportation.	7,227,310	6,504,653
General expenses	375,761	368,287
Railroad operating expenses	11,776,214	10,278,211
Railroad net earnings	8,399,579	6,771,819
Gross earnings, coal department	23,184,766	18,571,342
Net earnings, coal department.	1,173,206	1,209,519
Net earnings, railroad and coal	9,572,785	7,981,338
Other income	1,468,996	1,405,672
Net income	6,466,173	5,156,138
Dividends	3,816,000	2,867,174
*Improvement appropriations	.....	2,980,176
Year's surplus	2,650,173	Def. 691,212

*The sums charged in 1907 to income (general profit and loss) for improvements are not given either separately or in totals. The company, however, reports a surplus for the year (increase in amount at credit of profit and loss) of $3,025,218, which, added to dividend payments of $3,816,000, is $375,045 larger than the net income of 1907. In 1906 there was charged for new railroad construction $884,910, and for new railroad equipment $1,592,683, a total of $2,477,594 in the railroad department. In 1906 there was also charged for unmined coal $262,663, and for advances on unmined coal $239,919, a total of $502,582 in the coal department. There was, therefore, a total of $2,980,176 charged to income and credited to the various accounts mentioned in 1906. At the same time the company reported a surplus for the year of $493,801, which, added to the dividend payments of $2,867,174, is $691,212 larger than the net income for 1906. This difference is accordingly shown as a deficit for that year.

Delaware, Lackawanna & Western.

The Lackawanna to-day occupies probably a stronger financial position than any other American railroad. The profits from its anthracite coal mines are very large. They were particularly large during the year ended December 31, 1907. The production and the movement of anthracite coal has been little affected by the panic and industrial depression, so that the Lackawanna has had more favorable earnings than most other companies during the last few trying months. With a surplus for 1907 of $4,850,000 after a betterment appropriation of $3,820,000 the company is in a position to continue important improvements which were under way in more prosperous times.

This is a very great advantage, for not only do materials and labor cost less than they would have one or two years ago, but improvements can be made more cheaply when there is not a rush of traffic. The average railroad makes large improvements only when forced to do so by pressing necessity of the breakdown of its facilities. New work is undertaken at a time when traffic is congested, costs are high and efficiency is low. When industrial depression comes, all improvements which have not progressed too far are indefinitely postponed. In this way the average railroad gets the least for its money and goes through the same experience on each recurring wave of increased traffic, never having sufficient facilities to meet its needs in busy times. By having sufficient resources to carry on improvement work during dull periods, a railroad gains a



Delaware, Lackawanna & Western.

large advantage both in doing its new work better and more cheaply and also in being ready for great increases of traffic when they arrive. The Pennsylvania in carrying out the improvement work mapped out by Mr. Cassatt early in 1903 put itself in position to handle smoothly the immense traffic of 1906 and the first half of 1907. The Lackawanna is in an even stronger position in that it can continue improvement work even in the present trying times. It is probably the only railroad company, for instance, which is planning to begin work at once on an important cut-off.

This new line, 29 miles long, is to be built from a point between Dover, N. J., and Hackettstown, to a point near Portland, Pa. This section is the most congested part of the main line. The present line is crooked and hilly and has two tunnels, one of them a single-track tunnel operated on a gauntlet. The new line is to have reduced grades, light curvature and no tunnels and be 11½ miles shorter than the present line. About three years will be required for its construction. According to President Truesdale, "It is believed that contracts for the construction of this new line can be let to advantage in the near future, and that by the time it can be completed it will be urgently required to satisfactorily handle the company's traffic, which has been growing so rapidly in recent years that during the past year the capacity of the road for economical and satisfactory operation was reached for several months in succession."

Gross railroad earnings were $4,300,000 larger than ever before in the company's history. They were $37,300,000, against $33,000,000 in 1906, an increase of 13 per cent. Operating expenses increased $2,600,000, or 14 per cent., leaving net earnings of $15,700,000, against $14,100,000 in 1906, a gain of $1,700,000, or 12 per cent. Net earnings of the coal department were $4,200,000, against $2,700,000 in 1906, a rise of 56 per cent. The total income available for fixed charges and dividends was $20,900,000, against $17,600,000 in the previous year. During the year $438,000 first consolidated mortgage 7 per cent. bonds of the Oswego & Syracuse and also the outstanding $3,067,000 consolidated (then first) mortgage bonds of the Delaware, Lackawanna & Western matured, leaving the company without any bonded indebtedness of its own issue. There was a decrease in the item of interest on bonds of 32 per cent., and this item will disappear entirely in the income account for 1908. Net income was $13,900,000, which is equal to 53 per cent. on the stock, and this after including in operating expenses $2,000,000 for extraordinary expenditures. Dividends of 20 per cent. were paid. Last year renewals and betterments amounting to $3,800,000 were charged against income

and in 1906 renewals and betterments amounting to $5,600,000. The surplus for 1907 was $4,850,000, against $590,000 in 1906.

As on the Delaware & Hudson, both gross and net earnings were the largest in the history of the company. One particularly favorable development was the fact that the increase in earnings from merchandise freight was larger than in any previous year, amounting to 18 per cent. This increase would have been larger if it had not been for the great falling off in general traffic during November and December. Coal freight earnings increased 11 per cent., passenger earnings 9 per cent., express earnings 7 per cent. and earnings from transportation of milk, which amounted to $786,000, or more than the express earnings, increased 2 per cent. Alone the mail earnings decreased, by 3 per cent., and Mr. Truesdale takes occasion to remark that the service required by the post office department is more expensive and exacting than ever before, while at the same time the pay has been reduced.

As against the increase of 13 per cent. in gross earnings, operating expenses increased 14 per cent. The cost of maintenance of way was substantially the same as in 1906. The cost of maintaining equipment increased 28 per cent. and of conducting transportation 17 per cent., while general expenses increased 6 per cent. The Lackawanna includes such a large proportion of improvements in its maintenance of way account that this division of operating expenses by no means represents the costs necessary to keep the road in condition for operation. Betterments and additions costing over $2,000,000 were included in operating expenses and most of these were in maintenance of way. Including these, maintenance of way cost $5,198 per mile in 1907 and $5,160 in 1906. These are very high figures. They indicate the extensive improvement work that is being carried out by the Lackawanna.

Unit maintenance of equipment expenditures are not high as compared with other roads, but the splendid condition of the company's equipment is responsible for this. Repairs cost $1,722 per locomotive, against $1,461 in 1906; $628 per passenger car, against $472 in 1906, and $59 per freight car, against $46 in 1906. The increase in the cost of each of these items was probably largely caused by higher prices for labor and materials. During the last two years there have been bought and paid for out of income, 75 new locomotives, 69 passenger train cars, and 6,688 freight cars. A reason for the increase in cost of locomotive repairs was the fact that during several months of the year the business handled taxed the capacity of the motive power to the utmost, a condition under which locomotive repairs increase disproportionately.

Although freight traffic has about doubled during the past nine years, the total number of freight cars owned is about the same as at the beginning of the year 1900. The modern cars have from 60 to 100 per cent. greater capacity than those generally in use in 1900. They are not, however, regularly loaded to their full capacity, so that to a considerable extent the large increase in tonnage handled, with no increase in the number of cars owned, has been due to more efficient handling of equipment.

Conducting transportation increased in every item but one, and that an unimportant one. Most of the increase was due to advance in wages. It cost more to mine anthracite coal, and bituminous coal bought was more expensive than during the previous year. Although there were no serious accidents during the year, the loss and damage account was considerably larger, due, Mr. Truesdale believes, to the fact that railroads are being constantly held to stricter responsibility for accidents to persons or damages to freight.

Under general expenses, salaries of clerks and attendants increased 31 per cent. This was partly due to an increase in pay and partly to the larger forces which had to be employed to meet the requirements of various railroad commissions. Mr. Truesdale remarks that, "The public generally little appreciates how great and onerous this burden is steadily growing upon the railroads."

There was an increase of 15 per cent. in the number of tons of coal carried one mile and of 19 per cent. in the number of tons of merchandise freight. The ton mile rate on coal was 8.48 mills, and on merchandise 6.82 mills, which is a reversal of this relation on most roads. The train load was 490 tons, against 466 tons in 1906. The earnings per freight train mile on all freight were $3.53, against $3.21 in 1906, and $3.01 in 1905.

Improvements which were carried on during the year included the general rebuilding of about 35 miles of the most important telegraph lines, work on the new terminal at Hoboken, both for passengers and freight; construction of a second double-track tunnel through Bergen Hill, which is to be finished by the end of the summer; new third track up the west side of the Pocono mountain, from Moscow, Pa., to Gouldsboro; new shops, passenger station and office building at Scranton, including general rearrangement of yards, and new block signals. The new locomotive repair shops at Kingsland, Pa., were put in service during the year.

Mr. Truesdale discusses the railroad outlook for 1908 at some length. Part of his remarks have already been quoted in the *Railroad Gazette* (March 6, 1908, page 325). It has always been his custom to speak frankly about these matters. He believes that the railroads are being used as the playthings of politicians.

The following table shows the income results for the past two years:

	1907.	1906.
Mileage worked	957	957
Passenger earnings	$6,757,596	$6,216,224
Coal freight earnings	14,361,416	12,902,851
Mdse. freight earnings	12,235,808	10,342,423
Railroad gross earnings	37,264,473	32,962,880
Maint. way and structures	4,974,888	4,937,771
Maint. of equipment	3,731,082	2,909,335
Conducting transportation	12,254,278	10,503,943
General expenses	579,491	548,392
Railroad operating expenses	21,539,739	18,899,442
Railroad net earnings	15,724,734	14,063,438
Gross earnings, coal department	40,370,720	36,108,569
Net earnings, coal department.	4,224,921	3,655,119
Net earnings, railroad and coal	19,949,655	17,718,557
Other income	940,234	844,256
Net income	13,909,415	11,378,691
Dividends	5,240,000	5,240,000
Improvement appropriations	3,820,088	5,551,619
Year's surplus	4,849,328	587,072

NEW PUBLICATIONS.

The History of State Regulation in New York. Being Appendix J to the Report of the Public Service Commission of the First District. New York; 1908. Paper; 20 pages; 5¾x9 in.

This pamphlet has a very considerable value to the historian, since it collates not only the facts of state regulation in New York in past years, but includes a brief history of the principal rapid transit enterprises in the state and a summary of the rapid transit acts.

The Earning Power of Railroads. 1908 edition. Compiled and edited by Floyd W. Mundy, of Jas. H. Oliphant & Co., New York. 376 pages, 5x7; Cloth.

This statistical volume presents in comparative form the income accounts of 131 railroads, comprising most of the mileage of the country. and adds notes on their financial and physical history. The careful student may not always fully concur in some of the methods of derivation, but the value of the book is intended rather to be in its usefulness for quick reference. Its approximations of earnings, different classes of expenses, and capital, on a per-mile basis, are readily available.

Interborough-Metropolitan Company. A chart compiled in the statistical department of Kountze Bros., Bankers, New York, by M. E. Hatfield, Statistician.

This chart, which is dated March 1, 1908, and has just been issued, was compiled from information obtained from authorized accounting officers of the Interborough-Metropolitan Company. It sums up in complete form the various companies in this merger of subway, elevated and surface lines in New York City and the territory north of it. The Interborough-Metropolitan Company is described as "a business corporation and not a railroad corporation." A summary shows in one table all the various companies, their mileage, their stocks and bonds and the proportion owned directly and indirectly by the Interborough-Metropolitan, annual interest charges, guaranteed rentals and total fixed charges of each company. The chart is an exceedingly painstaking piece of work and gives a clear view of the whole traction situation. A similar chart, though not as extensive in its information, which was compiled by the Public Service Commission, is published in another column.

Graphical Handbook for Reinforced Concrete Design. By John Hawksworth, C.E. New York: D. Van Nostrand Co. 64 pages; 9 in. x 11 in.; 15 plates; cloth. Price, $2.50.

The object of this book is to present a short cut to concrete designing, and it is intended chiefly for those architects and engineers whose work in this material is intermittent and does not warrant the steady employment of a concrete engineer. In such offices the use of a graphical handbook like this should render it unnecessary to call in expert assistance for the solution of the class of problems that are ordinarily encountered.

The book opens with an introduction in which there is a general discussion of the methods employed in the development of a reinforced concrete design and a broad statement of the basis for the several plates that follow. In the presentation of these plates, one scheme is invariably followed. A general and detailed description of the plate is first given, followed by discussion of what it is intended to accomplish. Usually some general data are assumed. For example, in the plates for the determination of the dimensions of hooped concrete columns, one plate assumes the longitudinal reinforcement at six equally spaced rods set around the outside; in another, the assumption is that there are to be eight such rods. With these data alone the plate is such that, for a given load, the diameter of the column, the diameter of the longitudinal rods, and the diameter and pitch of the hooping wires can be at once determined. The same thing can be done in the determination of the resisting moments, spacing of bars, bending moments, location of the neutral axis, shearing resistance of various combinations of concrete and steel, square columns with various unit stresses, square columns in accordance with the New York building code and various

other matters concluding with the work of designing a reinforced concrete structure.

For those who are not disposed to accept such plates and tables as these on faith, there is an appendix in which the formulas upon which the plates are based are given and the methods of their determination fully discussed. The book will, therefore, serve two classes: those who do not care to check results, and those who are cautious and careful enough to be sure that they are right before going ahead. Hence its value for rapid calculations is very great, and in this respect will compare with the slide rule as a means for facilitating calculations where, if the instrument is properly graduated, the results are invariably accurate. In the same way, with a given plate, accurately drawn, the results must be true, and these plates ought to be useful in place of the elaborate and somewhat complicated calculations now employed.

The Strength of Chain Links.—This is the subject of Bulletin No. 18 of the Engineering Experiment Station of the University of Illinois. A series of experiments on chain links and circular rings, covering a period of two years, has been made for the purpose of confirming or disproving a theoretical analysis of the stresses in links and rings. A comparison of calculated and measured distortions affords the desired test. The result of the experiments is a complete confirmation of the analysis. Having a reliable theory, the bending moments and maximum stresses are calculated for links of various forms and the results of such calculations are applied to the formulas for the loading of chains given by Unwin, Bach and Weisbach. It is shown that the usual formulas for chain loads give maximum tensile stresses of 33,000 to 40,000 lbs. per sq. in., and maximum compressive stresses of 60,000 lbs. per sq. in. New formulas for safe loads are proposed. The bulletin has four appendices giving in full the theoretical discussion which is the basis of the experimental work. This bulletin will be of special interest to all engineers and manufacturers concerned in any way with hoisting and transmission. Copies may be had upon application to the Director, Engineering Experiment Station, Urbana, Ill.

CONTRIBUTIONS

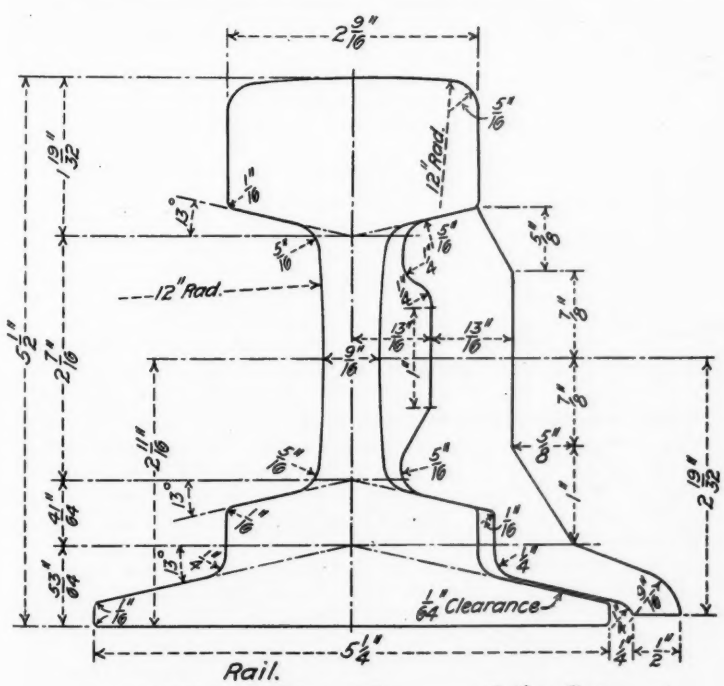
Rolling a Compound Rail Section.

Crafton Station, Pittsburgh, Pa., April 6, 1908.

To the Editor of the Railroad Gazette:

During the recent Maintenance of Way convention, inquiries were made concerning the three bearing angles on the Heinle rail. A number of railroad men and rail manufacturers are as yet unable to see how these angles can be made practical.

As explained in my communication in the *Railroad Gazette* of January 31, 1908, the standard flange is formed by lateral compression by the rolls, which churn the metal through the passes. The effect of this is to rapidly wear those roll surfaces depended on for accuracy, and, besides, to set up all kinds of internal strains in the metal while it is elongating. The mechanical disparities and the uneven cooling make the use of camber necessary; these influences also alter the relative position of all angles.



Heinle Rail and Splice Bar.

In rolling the Heinle section, no such mechanical difficulties are encountered; all angles are necessarily in the solid metal in the roll groove, and, therefore, all integral parts are elongated at the same rate of speed. This eliminates longitudinal tensions. There is no distortion, the cooling is uniform, and there is far less wear on the roll surfaces. Angles are not varied so much and there is more chance for accuracy, because there is less mechanical strain.

The conformation of the Heinle rail is easy on the rolls and material, and does not call for unnatural means to produce true sections. The purchaser will receive a structurally good article in spite of the present practice.

I intend that the third or lower angle on the splice bar shall be set off about 1/64 in. from the angle of the flange, so that the other two main bearing angles will engage the rail first. After they are drawn home, the third angle is brought to bear. This extra precaution will allow for variation in the section.

A. W. HEINLE,
Consulting Roll Turner.

Record Steam Shovel Performance.

Abbottsford, B. C., April 3, 1908.

To the Editor of the Railroad Gazette:

I should like to call your attention to a record for March made by a one and one-quarter yard traction shovel now working on the V. V. & E. construction between Cloverdale, B. C., and Sumas, Wash. During the 26 working days this shovel loaded a total of 62,000 yards, making an average of nearly 2,400 yards per day. The best day's work totaled 3,340 yards and the poorest one was 1,536 yards, the day consisting of two 10-hour shifts. During this time the shovel made four cuts, necessitating four "move backs." The usual delays were experienced such as derailments, shooting down the bank, etc. The shovel was served by two 10-car trains making an average haul of 500 ft. The material handled was fine gravel with some loose rock, but at several points blue clay streaks were encountered making the dumping of the cars somewhat slow. The work was in charge of Mr. J. P. Livingston for the Puget Sound Bridge & Dredging Co., of Seattle. I should be glad to know if you have knowledge of any records equaling this for the same sized shovel.

W. J. COLVIN.

(The *Railroad Gazette* will welcome letters from any of its readers who know of any steam shovel performance as good as this. —Editor.)

Economy of Better Rails at Higher Cost.

Philadelphia, Pa., April 13, 1908.

To the Editor of the Railroad Gazette:

The problem of securing a better quality of steel in rails is one in which both the manufacturers and the consumers are always interested, particularly at this time, when wheel loads have apparently approached very closely to the limit of endurance of Bessemer steel. One of the elements in this problem is the question how far the price of steel can be increased to secure a given increase in the life of the rail. At first thought, one would say that a rail lasting 10 times as long as the ordinary rail would be worth 10 times as much. This off-hand conclusion, however, is quite erroneous.

Assuming the life of ordinary rail (costing $28 per ton at the mill) to be 5.8 years, and that its net cost per ton in track (including labor, and deducting the value of scrap received from track) is $23, its net cost for a period of 58 years (or 10 times the life of an ordinary rail) would be as follows:

10 tons ordinary rail at $23 per ton (in track)	$230
Compound interest, at 5 per cent. on ten successive investments of $23 each, intervals of 5.8 yrs.	1,257
	$1,487

Now, as $88 at compound interest for 58 years at 5 per cent. would = $1,491, it is evident that it would not be economical to pay more than $88 net cost in track (or $93 at the mill) for rail which would last 58 years. Hence, in this case, 10 times the life would not justify more than 3⅓ times the price.

Again, assuming the same figures as above for the cost and the life of ordinary rail, we find that $70 at compound interest at 5 per cent. would amount, in 5.8 years, to $93, so that this $70, invested, would perpetually renew the ordinary rail. Therefore, as

we could pay $23 for a ton of ordinary rail and capitalize its perpetual renewal by a further investment of $70—making a total investment of $93, we could not afford to pay more than $93 net cost in track (or $98 at the mill) for rail which would last forever.

The formula below affords a convenient method of ascertaining what price could, economically, be paid for any special long-lived rail.

Let a = Net cost per ton of ordinary rail in track.
b = Life, in years, of ordinary rail.
c = Proportionate life of special rail.
("bc" would, of course, equal assumed life of special rail.)
x = Net cost per ton of special rail in track (to equal ordinary rail in economy).

Then,

$$\frac{\text{"ac" + comp. interest on "c" investments of "a" at "b" intervals}}{\text{Amount of \$1 at compound interest for "bc" years}} = x$$

Assuming that "a" = $23 and "b" = 5.8 years, and computing interest at 5 per cent., the corresponding values of "c" and "x" would be as follows:

"c"	"x"	"c"	"x"	"c"	"x"	"c"	"x"
2	$40	6	$76	10	$88	14	$91
3	54	7	80	11	89	15	92
4	63	8	83	12	90	∞	93
5	70	9	86	13	91		

J. CRAIG CRAWFORD,
Assistant Engineer, Penna. R. R.

New Automatic Block Signals on the Erie Railroad.

The main line of the Erie Railroad between Jersey City and Middletown passes through Rutherford, Passaic, Paterson, Ridgewood, Suffern, Tuxedo and Goshen. There are two main tracks from Jersey City to Hackensack river bridge, 3.1 miles; four from Hackensack river bridge to Rutherford Junction, 4.8 miles; two from Rutherford Junction to Ridgewood Junction, 11.1 miles; four from Ridgewood Junction to Suffern, 11 miles, and two from Suffern to Middletown, 35.7 miles. The Bergen county cut-off, double-track, is a shorter line (10.3 miles) between Rutherford Junction and Ridgewood Junction.

Another division is the New Jersey & New York railroad, leaving the main line of the Erie about eight miles out of Jersey City, running north. It is double-tracked to Oradell, 19 miles. Automatic block signals, protecting the main tracks, have now been installed in all this territory, aggregating over 200 miles of track. The installation was made by The Hall Signal Company under the direction and specifications of W. H. Willis, the signal engineer of the railroad company.

The signals are of the electric motor semaphore type, with straight posts, set alongside the track, where there are two tracks, and carried either on overhead bridges or on bracket posts, where there are four tracks. The installation is the usual home and distant application without overlap. Between Jersey City and Suffern the average length of block is about one-half mile, and ordinarily a home and a distant signal arm are mounted on one post. Between Suffern and Middletown the average length of block is about 6,000 ft., and between stations some of the blocks are two miles long; and as a rule distant signals have separate posts. Pipe connected Hayes derailers are installed in all sidings leading to main track at about the fouling point, and there are indicators at all switches.

Within the territory protected by automatic signals are a large number of interlocking plants, the high signals of which are electrically slotted to work as block signals as well as interlocking signals. In each interlocking cabin there are annunciators, which indicate the approach of trains on the main tracks, and indicators, which repeat to the signalman the condition of each block controlled by a semi-automatic slotted signal. The signals are arranged on the normal danger plan. The home control wire is carried through a normally closed circuit contact on all facing switches. All switches, when moved from their normal position, shunt the track circuit. Wherever possible, switch indicators are operated in parallel, which permits the use of the same resistance for all electro-magnet windings.

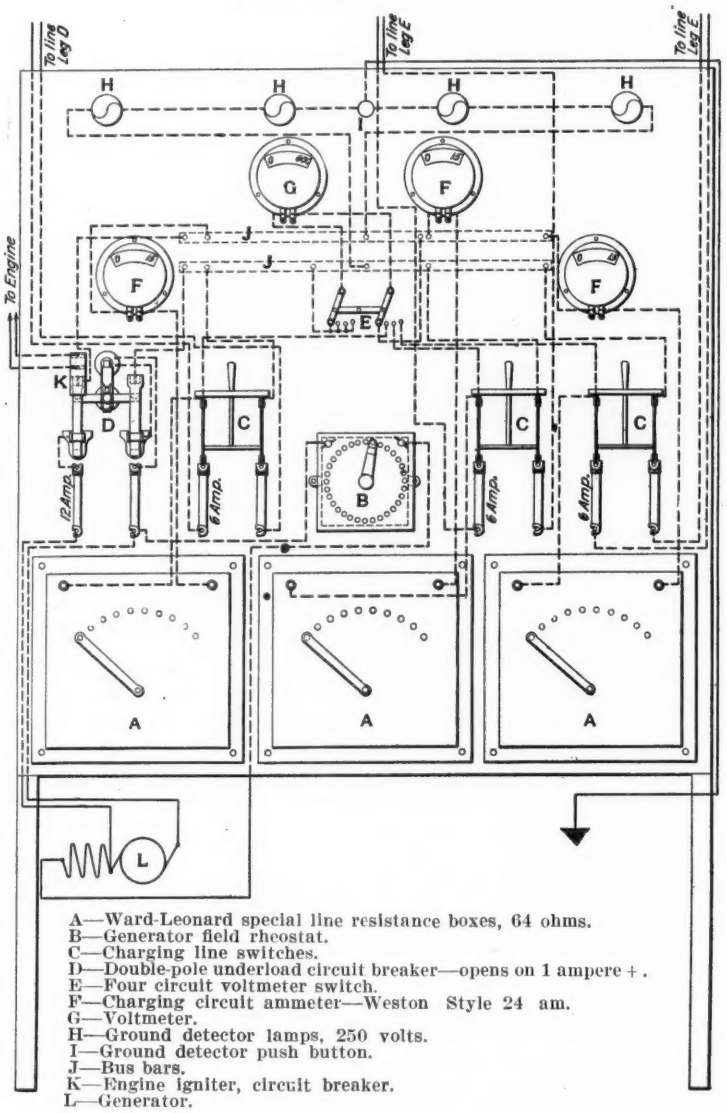
Indicator circuits are controlled from the home signal, which is at the entrance of the block in which the indicators are, in such manner that the indicators are set at stop when the home signal clears. The approach of a train to the home signal will not set the indicators at stop if the home signal remains at stop.

The line wires are carried on a line of cross-arms underneath the other wires on the telegraph pole line. They have triple braid weatherproof insulation. No. 10 B. & S. G. hard drawn copper wire is common for all signal circuits and No. 12 B. & S. G. hard drawn copper is used for all other purposes, except for battery charging wires. The charging wires are of various cross-sections, Nos. 10, 8 and 6 hard drawn copper, and are carried one at each end of the cross-arm for the signal wires.

All wires for connections to track and between pole line and instruments are soft drawn copper with okonite insulation and are carried in pine trunking supported on oak stakes. No. 14 B. & S. G. wire with $^5/_{64}$ in. wall of rubber and one braid connects the pole line wires to the various instruments; No. 9 B. & S. G. wire with $^5/_{64}$ in. wall of rubber and one braid connects the charging wires on the pole line with the charging switches; and No. 6 B. & S. G. wire with $^3/_{32}$ in. wall of rubber covered with one braid is used for all track connections. The braid on the common wire is red; on all other wire it is black.

Gravity battery, two cells for each section, operates all track circuits and is sheltered in cast iron chutes 7 ft. deep set in the ground in the usual manner.

Storage battery is used on all circuits other than track circuits. It is the Electric Storage Battery Company's Chloride Accumulator P T type box negative for 24 ampere hour capacity, excepting on the New Jersey & New York, where Westinghouse battery of a similar type is used. Each battery consists of five cells



A—Ward-Leonard special line resistance boxes, 64 ohms.
B—Generator field rheostat.
C—Charging line switches.
D—Double-pole underload circuit breaker—opens on 1 ampere +.
E—Four circuit voltmeter switch.
F—Charging circuit ammeter—Weston Style 24 am.
G—Voltmeter.
H—Ground detector lamps, 250 volts.
I—Ground detector push button.
J—Bus bars.
K—Engine igniter, circuit breaker.
L—Generator.

Power Switchboard for Erie Railroad Block Signals, Ridgewood, N. J.

connected in series and there are only two plates in each cell. The positive plate of one cell is connected to the negative plate of the adjacent cell with one piece of heavy lead tape, the ends of which are welded into the plates. Thus there cannot be a poor contact in the connection between cells as is sometimes the case with bolted connections.

At signals the storage battery is sheltered in the iron case that supports the signal; at crossing bells, remote from signals, specially constructed iron cases are provided; in interlocking cabins the battery is in a cupboard in the basement of the building.

In no case are signal circuits operated from batteries that supply crossing bells. As a rule there is a battery at each one-arm or two-arm automatic signal. All storage battery is in duplicate, one set being charged while the other set is discharging.

Cells of 24 ampere-hour capacity were decided upon because it was desirable to charge them but once each week, and, on this basis for charging, this capacity was found to be sufficient for a possible maximum movement of 120 trains per day per track. At a few of the interlocking stations, however, because of the relatively large

number of indicators and slots, it was found necessary to operate two sets of storage battery in parallel in order that the period of discharge be approximately the same as that for the battery on signals remote from the interlocking station.

The charging stations on the main line are at Rutherford Junction, Ridgewood Junction, Suffern, Oxford and Middletown; and on the New Jersey & New York, at Cherry Hill.

The illustrations show diagrammatically the location of the charging stations. It will be noted that the Middletown plant charges only one leg, or circuit, while all the others charge two, with the exception of the plant at Ridgewood Junction, which charges three legs, two on the main line and one on the Bergen County Railroad. It is expected that sometime in the future the automatic block signaling will be extended west to Port Jervis, in which event another charging leg will be added to the plant at Middletown. At Cherry Hill the limits of the north charging leg are to be extended with the signaling of the extension of the double-track north from Oradell.

Each charging leg, as shown, represents a maintainer's section, and the locations and limits for the charging plants were fixed upon mainly for this reason. Ordinarily all the legs, or circuits, served by one station are charged at the same time, but one leg can be charged at a time if so desired. Discharged battery is recharged as soon as it is cut out of service. Suitable switches are provided for cutting the discharged battery into the charging circuit and the reserve set, which is already charged, into the signal circuit. These charging switches are so constructed that the charging circuit cannot in any way become connected to the signal circuit; that both sets of battery may be cut in or cut out of the charging circuit at the same time; that one set of battery may be in the charging circuit while the other is in the signal circuit; or, that both batteries may be in parallel in the signal circuit.

Since the storage battery has a capacity of 24 ampere hours, the normal charging rate is three amperes. The circuits are designed so that the battery may be charged at this rate to a maximum of 2.6 volts per cell whenever it is considered desirable. The several legs of each charging plant are made to balance as nearly as possible so that there will be the same current in each. However, resistance rheostats are provided in series with the line so that, if for any reason the legs are out of balance, as would be the case if several sets of battery in one leg are cut out, balance could be obtained by throwing in resistance.

While the line loss in charging is considerable, it is not considered objectionable so long as the line voltage does not exceed 550.

The switchboard shown in the diagrammatic view is that at Ridgewood Junction. All the other switchboards are similar except that they provide for two charging legs whereas this board provides for three.

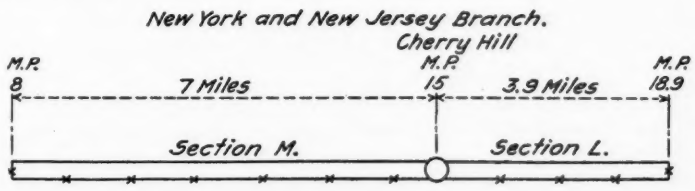
The electrical instruments and switches are of the usual isolated plant switchboard type mounted upon an extra quality heavy slate panel.

The circuit breaker, which is double pole, operates to open the generator circuit with a current of one ampere or less, and also takes the place of the usual generator circuit switch. Attached to one blade of the circuit breaker, as shown at K, is an insulated contact which opens the igniter circuit of the gasolene engine when the circuit breaker falls out. This avoids possible damage to machinery due to the engine racing when suddenly relieved of its load during the absence of the attendant.

The line rheostats have a total resistance of 64 ohms each, divided into equal steps. The resistance coils are built to withstand very high temperatures without injury.

All of the generators are of Crocker-Wheeler make. They are shunt wound, belt driven, and have a rated capacity sufficient to deliver six amperes at 550 volts, except at Ridgewood Junction, where the output is nine amperes at 550 volts. The gasolene engines driving the generators are Fairbanks, Morse & Company's vertical type. All of them are rated at 6 h.p., excepting that one at Ridgewood Junction, which is 9 h.p.

The storage-battery diagrams are as shown below. There are five cells of battery in each set and the maximum counter electromotive force is 2.6 volts per cell. The maximum current generated is 550 volts.



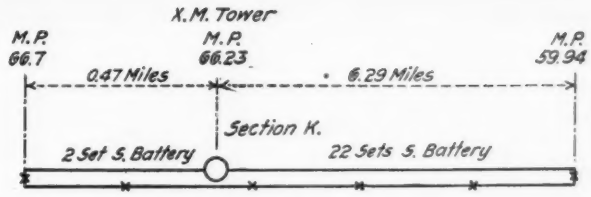
Section M.

Charging line	No. 10 B. & S. G.
Circuit resistance	70 ohms
Battery	15 sets
E. M. F. line drop	237 volts
Battery C. E. M. F.	195 "
E. M. F. generator termin'ls.	432 "
Charging rate	3 amperes

Section L.

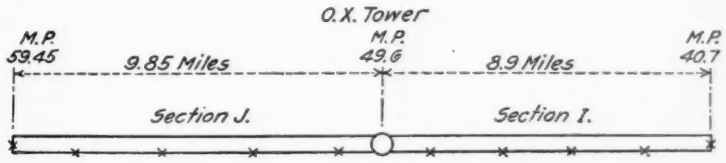
Charging line	No. 10 B. & S. G.
Circuit resistance	45 ohms
Battery	9 sets
E. M. F. line drop	135 vols
Battery C. E. M. F.	117 "
E. M. F. generator termin'ls.	252 "
Charging rate	3 amperes

Dynamo output ..... 6 amperes.



Section K.

Charging line	No. 8 B. & S. G.
Circuit resistance	54 ohms.
Battery	24 sets
E. M. F. line drop	162 volts.
Battery C. E. M. F.	312 "
E. M. F. generator terminals	474 "
Charging rate	3 amperes
Dynamo output	3 amperes



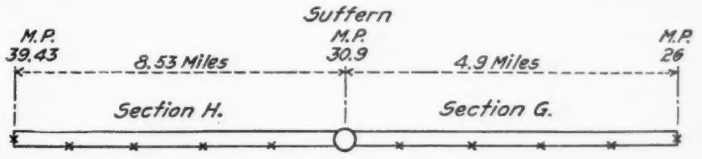
Section J.

Charging line	No. 6 B. & S. G.
Circuit resistance	50 ohms
Battery	28 sets
E. M. F. line drop	150 volts
Battery C. E. M. F.	364 "
E. M. F. generator termin'ls.	514 "
Charging rate	3 amperes

Section I.

Charging line	No. 6 B. & S. G.
Circuit resistance	47 ohms
Battery	28 sets
E. M. F. line drop	141 volts
Battery C. E. M. F.	377 "
E. M. F. generator termin'ls.	518 "
Charging rate	3 amperes

Dynamo output ..... 6 amperes.



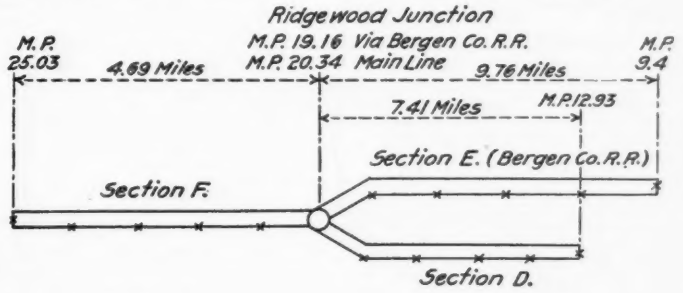
Section H.

Charging line	No. 6 B. & S. G.
Circuit resistance	46 ohms
Battery	28 sets
E. M. F. line drop	138 volts
Battery C. E. M. F.	364 "
E. M. F. generator termin'ls.	502 "
Charging rate	3 amperes

Section G.

Charging line	No. 10 B. & S. G.
Circuit resistance	56 ohms
Battery	28 sets
E. M. F. line drop	168 volts
Battery C. E. M. F.	364 "
E. M. F. generator termin'ls.	532 "
Charging rate	3 amperes

Dynamo output ..... 6 amperes.



Section F.

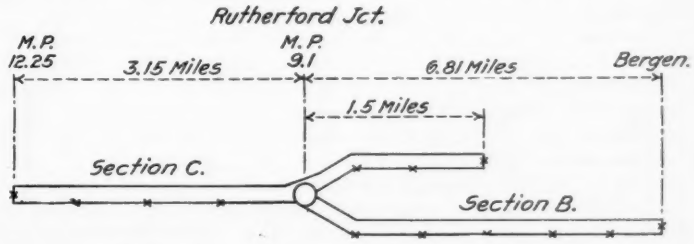
Charging line	(1) No. 8 B. & S. G.
Charging line	(1) No. 10 B. & S. G.
Circuit resistance	47 ohms
Battery	30 sets
E. M. F. line drop	141 volts
Battery C. E. M. F.	390 "
E. M. F. generator termin'ls.	531 "
Charging rate	3 amperes

Section E.

Charging line	No. 6 B. & S. G.
Circuit resistance	48 ohms
Battery	31 sets
E. M. F. line drop	144 volts
Battery C. E. M. F.	403 "
E. M. F. generator termin'ls.	547 "
Charging rate	3 amperes

Section D.

Charging line	No. 6 B. & S. G.
Circuit resistance	40 ohms
Battery	30 sets
E. M. F. line drop	120 volts
Battery C. E. M. F.	390 "
E. M. F. generator terminals	510 "
Charging rate	3 amperes
Dynamo output	9 amperes.



Section C.

Charging line	No. 10 B. & S. G.
Circuit resistance	57 ohms
Battery	27 sets
E. M. F. line drop	171 volts
Battery C. E. M. F.	351 "
E. M. F. generator termin'ls.	522 "
Charging rate	3 amperes

Section B.

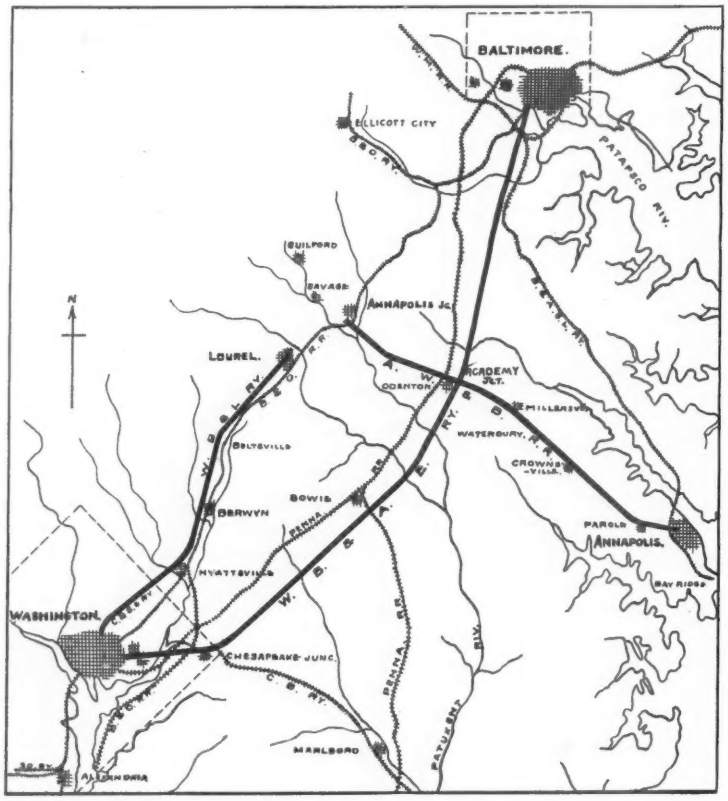
Charging line	No. 10 B. & S. G.
Circuit resistance	80 ohms
Battery	23 sets
E. M. F. line drop	240 volts
Battery C. E. M. F.	299 "
E. M. F. generator termin'ls.	539 "
Charging rate	3 amperes

Dynamo output ..... 6 amperes.

The Washington, Baltimore & Annapolis.

The Washington, Baltimore & Annapolis Electric Railway, the new 6,600-volt electric line which has been under construction (by three successive companies) for two or three years past, and which, on April 2, began running cars through between Baltimore and Washington, is now about finished. The company expects within a few weeks, in addition to the local cars, to run "limited" trains which will make no stops at way stations and will carry passengers from terminus to terminus, 38 miles, in one hour. This improvement in the service is delayed by the necessity of providing a number of additional cars and of further perfecting the track and roadbed. This improvement accomplished, the company, which thus far has not done much advertising, will actively bid for regular and excursion traffic between the two cities, and also from these cities to Annapolis, which, it is believed, should prove an attractive excursion resort. The officers of this road are not blind to the fact that the villages along the line between Baltimore and Washington are so small as to be almost beneath the notice of a passenger traffic manager, and they intend to pay special attention to the long-distance traffic, as just mentioned.

The cars now running, which start from either terminus every hour from 5.30 in the morning until 12.30 midnight, take one hour and 20 minutes, 25 minutes of this being consumed in the six miles of the line which lie in the streets of the cities. This low speed in the cities will, of course, be a limitation also on the express schedules, so that the 32 miles of the line which is on private right-of-way will have to be traversed by the expresses in 35 minutes. As the line is double-track and the track laid with 80-lb. rails, on good gravel ballast, this should be easily accomplished. As long as the business does not demand more than two trains an hour each way, the company proposes to continue to run by the time-interval and flagging system as at present; but the officers have in view the equipment of the line with automatic block signals, recognizing the necessity of using the space interval for dense traffic.



Washington, Baltimore & Annapolis Electric Railway.

The fare between Baltimore and Washington is 75 cents one way and $1.25 round trip. By the two existing steam railroads, the Baltimore & Ohio and the Pennsylvania, the one-way fare is $1.00 and the round trip $2.00, except on Saturday and Sunday, when it is $1.25. It is proposed to run the "limited" trains once an hour throughout the day. With such a service maintained with punctuality, and the freedom from smoke and cinders which constitutes such a strong "card" for electric lines in summer, the new line should be able soon to show what power it possesses to create new business and to take competitive business from its old and powerful neighbors.

The situation of the line as related to the steam railroads is shown in the sketch.

The length of the main line is 38 miles, which includes a trackage right over about four miles within the District of Columbia, owned by the Washington Railway & Electric Co. The Washington terminus is at 15th and H streets, N. E. From this terminus to the center of the city, at the Treasury Building, about two miles, passengers are carried on special cars of the Washington company.

The main line of the W., B. & A. is double track throughout and the tracks are laid with 33 ft. rails, weighing 80 lbs. to the yard. They are of A. S. C. E. section, and the ties are 6 in. x 8 in. All of the curves except one are of one degree or easier, and four-fifths of the main line is straight. There are no grade crossings, except in the case of two highways which are little used. The line at right angles to the main line, leading from the B. & O. to Annapolis, is a well-known and long-existing steam railroad, the Annapolis, Washington & Baltimore, now converted into an electric line. It is single track. From the junction with the B. & O. to that with the Pennsylvania this line has but a light traffic. From Academy Junction to Annapolis, 14 miles, the line is equipped with Blake electric signals, there being six meeting points. At Academy Junction the switches and signals are interlocked by apparatus furnished by the General Railway Signal Co., of Rochester, N. Y.

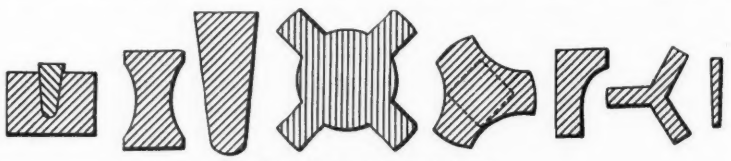
The line between the District of Columbia and Laurel—the Washington, Berwyn & Laurel—is one which was bought by the present company, along with other properties, but it is operated by itself, having no traffic connection with the main line.

The capital stock of the W., B. & A. is $5,250,000, all owned in Cleveland, Ohio. The first mortgage bonds amount to $4,250,000, and the second mortgage bonds to $1,000,000. The President of the company is George T. Bishop, and the Vice-President and General Manager is J. W. Shannahan. Mr. Shannahan's office is at Baltimore, where the company has built a terminal station. This station, with offices in the second story, is at Liberty and Marion streets.

Special Shape Tool Steel.

The high cost of high-speed steels makes it necessary that these products should be used economically. It is in order to meet these requirements that the New Metal Tool Steel Co., Portland, Me., has put out a number of special shapes, so designed that the requisite strength to resist the imposed stresses is obtained, together with the necessary cutting surfaces and areas, while the metal is so disposed as greatly to reduce the weight as compared with the usual rectangular section. This steel is rolled in a wide range of sizes and in the seven general shapes shown by the illustration. By this means the saving effected amounts to about 43 per cent., in the case of the star section, as compared with round, and 57 per cent. as compared with square having the same over all dimensions.

Tools made from these profiles do not require any special tool holders with the exception of the V shape. This form is of especial interest to railroad officers as it is adapted for use in tire turning. With this shape, a holder or seat is used as shown, and it comes in bar form so that it can be cut off in lengths to suit requirements. The groove is made to fit the bottom of the steel, and the tool holder blocks in the lathe tighten down on the top of the tool, holding it in the usual manner, securely fastening it.



Profile High Speed Steel.

Foreign Railroad Notes.

The efforts to increase the performance of locomotives on the Prussian State Railroads have resulted in a comparatively short period in raising the average yearly mileage from 20,500 to 29,200 miles; but this has been attended, naturally, with a very large increase in the cost of repairs.

The Russian Ministry of Communications has introduced in the Duma a bill to provide for double-tracking the Trans-Siberian at an estimated cost of $80,000,000. The Ministry recently appropriated $5,500,000 for double-tracking about 400 miles of road from Slatoust, in the Ural mountains, east to Samara, on the Volga river.

The "Technolexikon," which the Society of German Engineers announced in 1901, inviting the co-operation of Americans and others, and which was to include the technical terms of all imaginable trades in German, French and English, is now given up, after an expenditure of $120,000, because it was found that it would need to be enormously large—an encyclopedia in size, rather than a dictionary. It is very true that to be complete it would need to be very large; but there is little doubt that, properly executed, it would be worth many times its cost. This is not saying that the money to pay for it could be had, however.

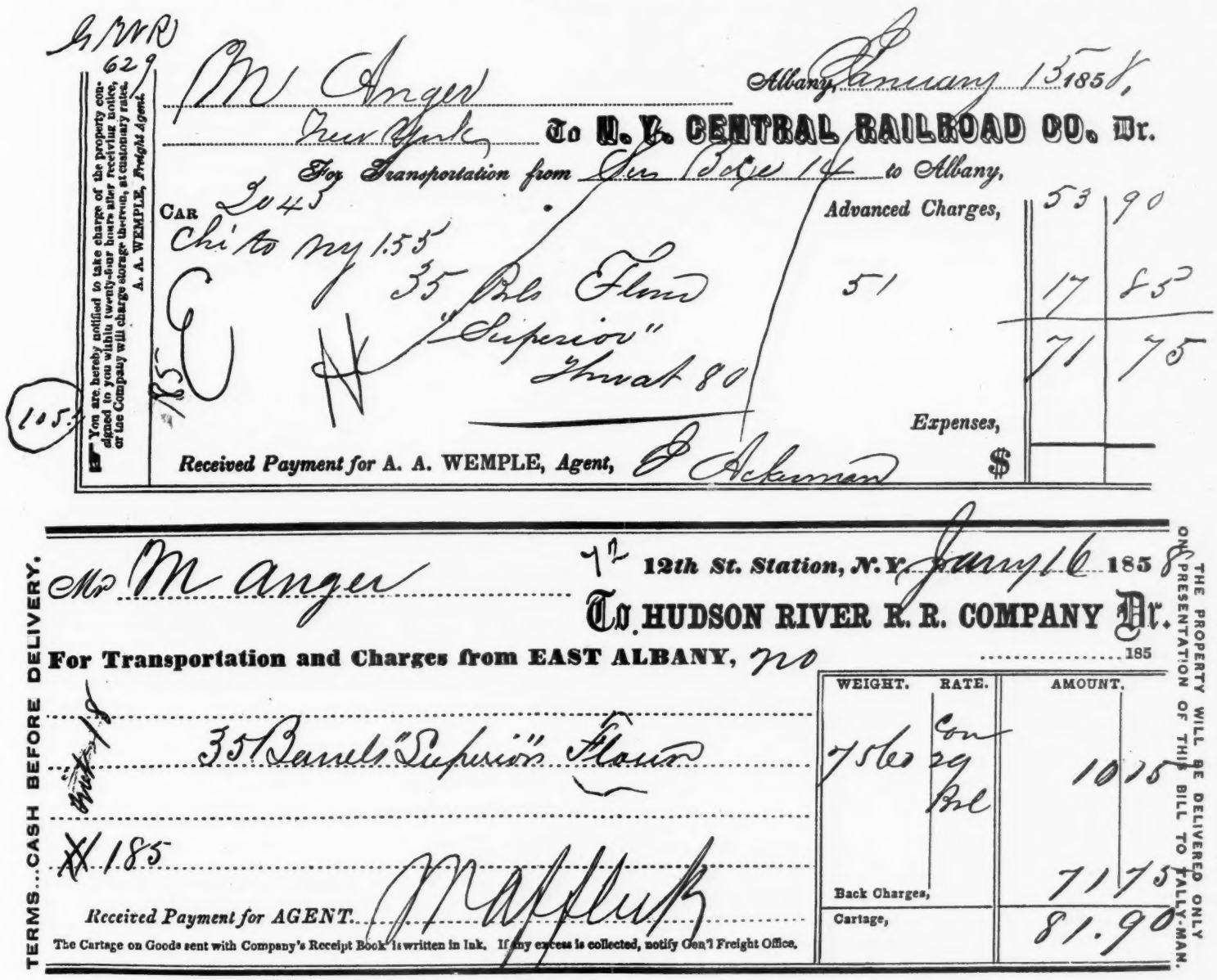
Two Freight Bills of 1858.

Two freight bills, one dated January 15, the other January 16, 1858, covering charges on a shipment of 35 barrels of flour from Chicago to New York, are reproduced herewith. The first covers the shipment from Suspension Bridge to Albany over the New York Central Railroad, including back charges from Chicago to Suspension Bridge, and the second covers shipment from East Albany to Twelfth street, New York City, over the Hudson River Railroad, the two parts of the present New York Central & Hudson River Railroad main line from Buffalo to New York being separate companies.

The striking thing about these freight bills is the difference between the freight charges 50 years ago and the freight charges now. These 35 barrels of flour were handled three times, and the freight charges were as follows:

Chicago to Suspension Bridge.....per bbl,		$1.55	$53.90
Suspension Bridge to Albany	"	.51	17.85
Albany to New York	"	.29	10.15
		$2.35	$81.90

In contrast with this rate of $2.35 a barrel, the present freight rate on flour from Chicago to New York is 35 cents a barrel. The present cost of sending a full carload of flour from Chicago to New York is about the same as the cost of sending these 35 barrels in 1858.


G W R
629

Albany, January 15 1858.

M Anger
New York
To N. Y. CENTRAL RAILROAD CO. Dr.
For Transportation from Suspension Bridge to Albany,
CAR 2043
Chi to Sy 1.55
35 Bls Flour
"Superior"
Swat 80
Advanced Charges, 51 — 53 90
17 85
71 75
Expenses,
Received Payment for A. A. WEMPLE, Agent, J Ackerman $

You are hereby notified to take charge of the property consigned to you within twenty-four hours after Receiving hooks, or the Company will charge storage thereon, at customary rate.
A. A. WEMPLE, Freight Agent.

105

TERMS...CASH BEFORE DELIVERY.

Mr M Anger
12th St. Station, N.Y. January 16 1858
To HUDSON RIVER R. R. COMPANY Dr.
For Transportation and Charges from EAST ALBANY, No 185

	WEIGHT.	RATE.	AMOUNT.
35 Barrels "Superior" Flour	7560	Con 29 Bbl	10 15
Back Charges,			71 75
Cartage,			81.90

Received Payment for AGENT. M Fluck

The Cartage on Goods sent with Company's Receipt Book is written in ink. If any excess is collected, notify Gen'l Freight Office.

THE PROPERTY WILL BE DELIVERED ONLY ON PRESENTATION OF THIS BILL TO THE CARMAN.

Two Freight Bills of 1858; New York Central Railroad and Hudson River Railroad.

The railroad in eastern China from Tien-tsin (the port of Pekin) south to Nankin seems assured. The Germans are to raise £3,150,000 for the northern 425 miles, which will connect with their railroad in the province of Shantung; and the English £1,850,000 for the 250 miles north of Nankin. The road, however, is to be a government enterprise, the Germans and English having inspecting engineers and accountants to assure that the security for their loans is adequate. The bonds, bearing 5 per cent., are offered at 98. This line will be nearly parallel with the existing Pekin-Hankow Railroad, and will be nowhere very distant from the Imperial Canal, which unites the Yang-tze and the Hoang-ho, passing through a thickly peopled and productive country, which has suffered terribly from floods since the Hoang-ho changed its outlet to the sea in 1852 to a point some hundreds of miles north of its old one.

French Railroads in 1905 and 1906.*

BY C. COLSON,
Engineer in Chief of Roads and Bridges in France, Councillor of State.

In the 10-year period from 1896 to 1905, gross earnings increased 23 per cent. in France; 26 per cent. in England and 54 per cent. in Germany. This does not show exactly the comparative increase in business in the three countries as the average rate per ton-mile has fallen 12 per cent. in France and only 7 per cent. in Germany. This decrease is continuing in France, but in Germany freight rates have been stationary since 1899. There are no statistics available, which show the average rate in England. It is true, however, that the increase in business in Germany is double to what it is in France and England. This condition is to be expected since the essential factors in growth of traffic are increased in people and commodities to be carried, in the number of consumers and in the production of coal. In the 10 years referred to the population of Germany has increased 15 per cent.; that of England 10 per cent. and that of France only 2 per cent. Coal production has increased 56 per cent. in Germany; 21 per cent. in England and 27 per cent. in France. In the United States during this period, gross earnings have increased 80 per cent. while the population has increased 19, and coal production, 87 per cent.

In 1905, expenses in England and in Germany increased proportionately slightly less than earnings and in France slightly more. The railroads in France had made particular efforts to reduce expenses in previous years, so that there was less room for improvement. The returns on capital invested remain at 4 per cent. in England; increased to 4.3 per cent. in France and was more than 6 per cent. in Germany, where construction has been much easier

*From a paper "Review of Traffic Questions" in the *Revue Politique et Parlementaire*. Reprinted in the *Bulletin of the International Railway Congress*.

and cheaper than in France. The accompanying table shows the comparative results of operation in France, England and Germany during 1903, 1904 and 1905.

The estimates for 1906 show that earnings have increased about $20,000,000* in England, $40,000,000 in Germany and $240,000,000 in the United States; to a less extent France has also profited by the rebound from the period of depression, which ended in 1905. Two special reasons, however, prevented the roads from making as good a showing as the general prosperity of business might have led one to hope. The Courrières accident and the strikes which succeeded it led to a serious decrease in production of coal in the north and the Pas-de-Calais and the imports which made good the deficit, mostly brought by sea, did not provide our lines with as much traffic. On the other hand, the vintages of 1905 and 1906 were poor in quantity, especially in the Midi, and yet the fall in the selling price, which had followed the exceptional 1904 supply, continued, because the supplies derived from it were not yet exhausted. Thus, both at the north and the south of the country, the two most important items of traffic were heavily handicapped. Decrease in long distance traffic of coal from the northern districts, carried at very low rates, explains why the average rate per ton-mile has remained stationary from 1905 to 1906, although, as happens each year, several reductions in rates have been made. Still it really seems as if suggestions for reductions were becoming less and less frequent, in face of the growing protests aroused by the confirmation of special reductions to meet individual trade conditions, and also by the new burdens imposed upon the companies by legislative enactments of which later on we quote two instances. For the first time in a long while the operating ratio has gone up slightly. This growth is due mainly to the causes that always make themselves felt when there is an exceptional glut of traffic. Fuel and all consumption materials rise in price at times of universal prosperity; as regards coal, the effects of the rise, which are usually spread over several years owing to the long run of contracts, was felt suddenly in 1906 when our northern coalmasters had to suspend promised consignments. When it is necessary to cope with unexpected needs by chance methods, to free stations as soon as possible and take care to forward consignments at once rather than load trains properly, when one has to throw in a fairly large number of inexperienced helpers, etc., it almost always happens that the extra traffic arriving unexpectedly costs more than it brings in.

Besides these temporary troubles, two new laws have led to an extra expenditure that will recur regularly. The Rabier law, which repeals the clauses till now inserted in the special rates involving reductions of rate to lessen the liabilities of the carrier, means an increase in claims for damage. The weekly holiday law, on the other hand, though not legally applicable to railroads (whose business lends itself still less than any other to the application of uniform regulations), must necessarily force the companies to grant to their staff an increase in the days of freedom allowed at a regular interval, without its being possible for them to make good entirely this permanent decrease in the work they get out of their men by abolishing the customary annual leave; under this head, the year 1906 has begun to be burdened with expenses that will grow very markedly in 1907. The agitation which is being manifested throughout the working classes is not unnoticeable in its effects upon railroad operation; though such lack of discipline and attempts at coercion are, among this select staff, far from exerting such ravages as in many businesses and especially in government owned industries, yet we find in various ways some slackening in the zeal of the men, less keenness to do well, fewer attempts to cope with temporary difficulties, and the result is that the service is not only more costly but also less efficiently carried on.

Far from exceeding the estimates of the companies, the purchases of rolling stock were well below the figures they would have wished to attain, because the builders, being overwhelmed with orders, could not supply the requisite number. In 1906 the stock was increased by about 160 locomotives, 500 passenger cars and 3,000 freight cars; to this must be added some 30 motor cars, the trial of which seems to give satisfactory results and which will probably make it possible to improve greatly the service on unimportant lines by making it more frequent without unjustifiable cost. The orders given out, which will be filled in 1907 and 1908, reach the enormous total of 900 locomotives, 1,200 passenger cars and 31,000 freight cars, costing between $40,000,000 and $50,000,000. The issues made by all the great companies during 1906 did not exceed $13,000,000. The exhaustion of reserves, payment for large orders of rolling stock and for additional construction necessitated by the growth of traffic, will oblige the companies to issue more capital this year and next, and if the money market does not improve, this borrowing will cost all the more, because it will force prices down further still.

The Northern Railroad's net profits increased $1,200,000; when they increase $300,000 more, the company will begin to share profits with the state. But the rise in the cost of fuel and labor may prevent this further increase. Under the combined action of all the influences that are converging to diminish the duration and vigor of labor, the average output per day's work of the pitmen has fallen in the Northern and Pas-de-Calais mines from 2,469 lbs. between 1895 and 1899 to 2,282 lbs. between 1901 and 1905.

The most brilliant results are those of the Eastern Railroad; gross earnings increased $2,800,000, or 7 per cent., and net earnings $1,600,000. Doubtless the exceptional prosperity of the metallurgical industry, which has provided 250,000 tons extra for transport (on the top of an increase of 271,000 tons already realized in 1905), will only prove temporary. But the opening up of iron mines, permitted a few years ago, means a source of lasting prosperity, and may some day render the Meurthe-et-Moselle district one of the main metallurgical centers of the world. At present the absence of local coal and the shortage of labor prevent the district from reducing more than a part of the ore extracted.

The Paris, Lyons & Mediterranean has also seen the returns of its line improve extraordinarily, with an increase of $4,600,000 in gross and $1,700,000 in net profit. A sinking fund terminated in 1906, so that $900,000 additional is saved for surplus. This amounted to $2,900,000, of which two-thirds go to the state; no profits to the government were earned in 1905.

In the companies serving the other half of France, the western side, we find a much less marked improvement. Running through what are mainly, agricultural districts, they hardly benefit from the extra traffic which is brought about by a manufacturing boom, but they do feel the effects of the rise in prices that accompanies it, so that in years like 1906 their increased expenses absorb almost the whole of the increased earnings. More especially, in that particular year, the substitution of English coal, disembarked at the ports they serve, for the French coal which usually reaches them loaded on the Northern Company's cars, forced them to run, with their own resources and their own rolling stock, a service for which in normal times they have nothing to provide except hauling power for trains reaching them ready marshalled; the result was to increase greatly the difficulties of conducting transportation and they gained nothing because the mileage run on their own lines was no greater.

The Western Railroads with $2,000,000 more in gross earnings, found its net profit only $340,000 greater. The deficit after interest charges which the state had to make up according to its guarantee fell below $1,200,000 and precisely because the improvement is not dependent upon the sudden boom in manufacturing, we may hope it will last.

The Orleans Company realized nearly $2,200,000 more in gross earnings, with an increase in expenses of over $1,800,000, so that, after allowing for first charges, the payment made to the state for the repayment of its debt is only $120,000 more than before.

The Midi Company, with nearly $600,000, increased gross earnings, has an increase in expenditure of over $600,000, half of which is due to the extra charge relating to pensions. These new charges, coinciding with the crisis in the wine trade, cause a decrease of $60,000 in the net profit, which just leaves the company the income requisite to avoid its again beginning to call upon the guarantee of interest.

The State system has a still heavier decrease in net profit, amounting to $100,000, despite an increase in gross of nearly $400,000.

Despite these charges, three of the great companies are paying over to the state, out of the profits for 1906, a total of $7,500,000,

*Francs converted into dollars at $0.20.

Comparative Results, Railroads in France, England and Germany.

	France.			England			Germany.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903-'04.	1904-'05.	1905-'06.
Average mileage	24,203	24,358	24,514	22,308	22,556	22,742	32,561	33,182	33,803
Passenger earnings	$100,000,000	$101,400,000	$104,200,000	$202,000,000	$202,200,000	$203,400,000	$147,200,000	$154,000,000	$165,000,000
Fast freight earnings	33,600,000	35,800,000	37,000,000	40,200,000	42,000,000	42,600,000	21,200,000	22,600,000	24,400,000
Slow freight earnings	162,400,000	161,000,000	168,600,000	278,400,000	279,600,000	284,800,000	335,000,000	351,000,000	378,200,000
Miscellaneous earnings	4,800,000	4,800,000	5,600,000	39,400,000	40,600,000	42,400,000	36,000,000	38,400,000	40,800,000
Total receipts	300,800,000	303,000,000	315,400,000	560,000,000	564,400,000	573,200,000	539,400,000	566,000,000	608,400,000
Working expenses	160,200,000	157,400,000	164,600,000	346,200,000	349,200,000	353,800,000	341,600,000	360,000,000	386,000,000
Net earnings	140,600,000	145,600,000	150,800,000	213,800,000	215,200,000	219,400,000	197,800,000	206,000,000	222,400,000
Capital cost	3,455,000,000	3,488,400,000	3,514,200,000	5,320,000,000	5,428,000,000	5,496,000,000	3,457,000,000	3,545,000,000	3,638,000,000
Interest on capital, per cent	4.08	4.17	4.30	4.00	3.97	4.00	5.72	5.81	6.16
Earnings per mile	12,360	12,425	12,875	25,040	25,040	25,200	16,545	17,060	17,990

whereas one only calls upon the guarantee, and that for $1,200,000 only. Doubtless this period of prosperity will be followed, like the others, by a period of bad times, and on the other hand we see already appearing increases of certain charges owing to the new construction and supplies of rolling stock requisite to carry on the service, for the weekly rest, etc. But the last year has already borne sufficiently heavy special charges to lead us to hope that its net profit does not correspond with any specially favorable situation. Moreover, 1907 commenced under favorable auspices. Even if we do not count fully upon the continuation of such high repayments as those which the treasury received last year, we may hope that the era of deficits is closed, and that we have definitely entered upon the period, once regarded as chimerical, when the guarantee and sharing accounts of the great companies, which showed in 1893 a balance against the state of $20,000,000, will show the state receiving a respectable sum, provided that no new law intervenes to add additional charges again to all those with which the working of railroads has been loaded.

The present question, in the matter of traffic, which for several months has upset the commercial community, filled the papers and occupied parliaments, is that of the rolling stock on railroads and the delays resulting therefrom in the service. The characteristic feature of this crisis is its generality. Those in favor of state operation have seized this opportunity for blaming the companies, and the companies' organs have taken a vindictive pleasure in exposing the shortcomings of state operation; the truth is that throughout the whole world, states and companies have found themselves coping with similar difficulties and have overcome them well or ill, more often ill than well, according to their individual resources and ability. We shall lay no stress on the facts pointed out in France, not in order to shirk them, but because they are not the ones that are likely to be forgotten at home. In Germany, in that pattern country of state working, complaints are universal and the Minister for Public Works in Prussia was obliged, in the budget debate, to acknowledge that they were well founded. Already, in the preceding winter, his predecessor had confessed that the service was in unprecedented confusion, and this winter the situation was no better; the coal owners affirmed that there was no assurance that their consignments would be forwarded and there were even some who requested leave from their French customers to deliver English coal by sea, for lack of trucks to despatch them German coal.

In Austria and in Hungary, some mines were on the point of closing down, some works had to be shut, for want of means of transport. In Belgium, traders and passengers continue to cry out. And if we take in the other hemisphere the country where company operation enjoys the most extensive liberty, we find that in the United States there is a clamor on all sides against the inability of the railroads to give a proper service, inquiries are opened on the causes of the trouble and the remedies necessary. But in this wholesale competition, the palm belongs unquestionably to Italy. Not doctrinally, but because they could not come to terms with the leasing companies to prolong their tenure, the state took over the operation of its roads in 1905; forgetful of the proverb, it changed horses, if not in mid-stream, at least on entering the water, just when the boom in industry in Lombardy and the approach of the Milan exhibition made exceptionally heavy traffic probable. The impossibility of coping with it, the resulting confusion, the block in Genoa where half the goods disembarked had to lie unattended to, and the closure of works for lack of fuel, are facts universally known.

The universal character of the crisis depends upon the fact that the underlying cause is itself universal; it is in fact the return of great activity in business which comes periodically with the regularity of the swing of a pendulum, and the coincidence of which throughout the whole world becomes more and more precise in proportion as the facility of communications renders the dependence of markets upon each other more complete. It should be added that, now that railroad traffic possesses an international character, as soon as the crisis becomes somewhat acute at any one point, it necessarily leaves its mark; countries which are short of rolling stock do not resist the temptation of using the cars that reach them loaded from foreign countries, instead of returning them immediately empty or full; those whose stations are blocked keep at the frontier trains which would accentuate this block still further, blocking in their turn thus the roads of their neighbors and laying idle their rolling stock. The Paris-Lyons-Mediterranean thus felt the effects at Modena of the confusion reigning in Italy, and Austria was on the point of ceasing sending cars to Italy.

If the crisis returns periodically, some one will say, nothing can be easier than to foresee it and make provision ahead. To a certain extent, that is true. The able investigations of Mr. Juglar have established the regular character of the waves of prosperity and of stagnation in business, and experience proves this law with astonishing precision. We have stated frequently that it would be wise on the part of railroads to provide themselves beforehand with rolling stock, when the builders would be only too happy to work for them at low prices and not expose themselves to the risk of having to give out late, when prices are at their highest, orders which often will not be filled until the need is past. Dare we say it? The enormous orders being filled, instead of reassuring us, frighten us a little.

We know well that under pressure of the inspecting department, in face of the public clamor, the companies have no other way of shifting their responsibility, in times of traffic blocks, than to prove that they have hammered at all doors to increase their equipment. But in order to arrive at giving out their orders regularly, it is not a wiser way to overdo them during times of stress than to stop them when requirements slacken. In 1905, the Prussian Minister of Public Works, in order to excuse his management for not having bought during the lean times of 1901-1902 the rolling stock that he needed when times got better, recalled the plethora in which it found itself at that moment; having received delivery, towards the close of the preceding period of activity, of cars ordered to meet the previous deficiency, they had to build sidings to accommodate the idle cars. We had a similar experience in 1885 and 1886. It is to be feared that about 1908-1909, when all the rolling stock so impatiently awaited to-day is lying idle, orders will have to be stopped and that then, forgetting the noble resolutions everybody is now making for the future, they will delay too long in beginning to give out orders.

And it is not only cars that are deficient; everywhere professional men say that the fault lies less in the want of sufficient rolling stock than of siding and sorting yards, facilities suitable for hastening the handling and making up of the trains. In a remarkable article recently published in the *Revue du Mois*, Mr. Labastie showed how the rapid movement of rolling stock possesses as much and more importance than the increase in its quantity and what difficulties this offers. As regards fixed facilities too, it is during the peaceful times of stagnation that preparations ought to be made to carry on the war against coming difficulties. But in that case, forecasts are more uncertain; it is not sufficient to know that a recovery will surely come; one must know, moreover, at what points the new requirements will appear, and there is a serious risk, in putting down equipment beforehand, of not doing it at the right place.

But, do what one may, it will always be financially impossible to provide railroads with enough equipment to make the service run as well during times of exceptional business activity as in normal times. No country could stand paying interest on such an exorbitant capital. Every paper has been quoting a letter in which one of the American railroad kings, Mr. Hill, estimated $1,100,000,000 per year for five years as the sum needed to put the railroads of the United States in a position to meet their requirements. As we have not seen the original statement, we do not know whether Mr. Hill was posing as an ironical cynic or as a bragging millionaire; but it is anyway true that even if he lived among a group of financiers who could in five years find for the American railroads the $5,500,000,000 he wants, the contractors and laborers able to get through the money in so brief a time, provided only a pause ensued at the end of the five years, at the very first moment of revival that followed there would be a deficiency of rolling stock or men or yards and stations at some point or other. It is not possible always to keep standing idle but ready the equipment requisite to meet the maximum needs which will arise during one or two seasons, during the eight or ten years of the cycle which brings the periodical crises. The only reasonable method in practice is to regulate the growth of men and equipment according to the average increase, and to cope with sudden increase of traffic by a sudden surplus of energy.

But at the moments when this surplus is necessary, any accident is enough to bring about serious trouble. For a little time, one can get from the men and from rolling stock exceptional work. But suppose at a certain point, the abundance of traffic renders it impossible to balance the outgoing and incoming consignments, then promptly the lines get blocked and rolling stock accumulates; it is no longer possible to clear the loaded cars and take them to the point where they ought to be unloaded; there is no longer time to arrange them once they are empty to suit requirements, to make up trains when they are reloaded, so as to fully utilize the tractive power of the engines; one has to resort to pooling engines, running the same locomotives constantly with different crews, instead of leaving each under the control of the same engineman who is responsible for its condition; being less carefully inspected, despatched less often to the shops, because they cannot be dispensed with, the engines end by causing more irregularities and breakdowns in the service. Soon the work got out of them, instead of growing with requirements, decreases, and the difficulty of dealing with the increased traffic becomes an impossibility.

To escape this calamity, it is necessary, from the very commencement of periods of activity, to make demands upon everybody's good will and overwork the indolent a little. It is no longer upon the railroad that the public authorities can usefully make demands at this moment; naturally they intervene to keep it up

to the mark during periods of stagnation, but at extra busy times, the needs it has to meet, and the responsibilities it incurs stimulate its zeal better than any abuse. Then it is the consignors and consignees who must be urged to facilitate the promptness of the public service, by cutting down, for instance, the time they are allowed for loading and unloading cars when this business depends upon them. Under these circumstances, the position of private companies is always more difficult than that of state systems, because the latter have always backing them public authority of which they are an emanation, whereas between the companies and the public, the inspecting department naturally tends to side with the public whose representative it is. During the present crisis, we have seen the government, in Italy, frequently suspend consignments to such or such overcrowded points—in Austria, suspend for several days the ordinary freight service between Vienna and Galicia; in Hungary, suspend entirely the consignment of freight from January 28 to February 8; in Belgium, close the frontier on January 30 and 31. In France, the companies could not get leave to make a few alterations they asked to be allowed to make temporarily in the regulations.

Not only has the state not come to their aid, but it has singularly aggravated their position by the law on the weekly rest-day. It is true, the law is not applicable to the railroads; but by stopping entirely the loading and unloading by private persons on Sunday, both at stations and on private sidings, it has seriously delayed the liberation of a number of cars. Those in favor of state intervention in the operation of railroads, frequently support their theories by adducing the necessity of alleviating periodic crises which give rise to speculative commitments; the moment selected for applying the new law is a typical instance of the small amount of foresight with which public authorities, when they intervene in economic phenomena, do it in a manner most likely to aggravate crises instead of alleviating them. Whatever opinions one may hold about the utility of measures which limit the hours of labor, it must be acknowledged that the act of putting them into force must always bring about transitory difficulties; the latter become particularly prominent when there is a scarcity of labor everywhere, as at the present moment. If originally applied at a time when the number of those involuntarily idle was considerable, the law on the weekly rest-day might have decreased distress, by obliging manufacturers to make good the decrease in days of labor by an increase of their employees; then, until the next revival, industry would have had breathing space to accustom itself to the new regime. The wise thing would be even to suspend or temporarily alleviate the stringency of laws of this kind, when hands are everywhere deficient; but by putting them into force just at these times, the legislator aggravates the difficulties of the service of which he then makes a grievance to traders.

Despite these difficulties, it really seems as if France is one of the countries in which the recent crisis was least felt. As far as can be judged, except in the case of England, which appears to have almost entirely escaped it, all the manufacturing countries have suffered more than we have. Our railroads are, moreover, among those best supplied with rolling stock, considering their traffic. The main difficulty in their management is the lack of elasticity in the regulations upon which we have insisted in this review on many former occasions. The intervals allowed under our special tariffs are certainly excessive in normal circumstances; but they equally apply in critical times, whereas in Germany, a railroad is only bound to supply rolling stock as and when it is at liberty. Of course we have no desire to see extended to France a regime under which the public is at the absolute discretion of the railroad management; but to grant some relief in the obligations of the companies in times of stress, to subject their customers to some hardships in order to set at liberty the rolling stock, would not be asking too much, and as some compensation for these easements, the time limits might be decreased under normal circumstances, once it was understood that lack of fulfilment did not render the company liable when it was due to an abnormal increase of traffic.

Our whole legislation is based on the notion that railroads ought at all times to insure under similar conditions the carriage of all the traffic entrusted to them; but this idea is contrary to the very nature of things. Unquestionably, railroads being invested with a monopoly, cannot be left free to grant or refuse their services according to their convenience, and it must be assumed as a principle that they are bound to meet all demands, so long as a judge has not decided that they were prevented by conditions beyond their control. But in order that the exceptional growth of traffic, at times of extreme business activity, may not produce these conditions, it is essential they should be given all the facilities compatible with the requirements of the public. No industry in the world, no traffic organization whether by land or water can be so equipped permanently as to satisfy all the clients who may offer themselves at a busy time in the same manner as in normal circumstances. When the blow comes, railroads submit to the terms of their contractors who only accept such orders as they can carry through; railroads too have to accept all the traffic that their usual competitors, barges and coastwise ships, refuse for lack of room; at least they should be helped to accommodate it.

In insisting upon these considerations, we certainly do not intend to entirely shift the responsibility from the shoulders of the companies in the present crisis. We have often enough affirmed and reaffirmed that it would be wiser on their part not to reduce as much as they often have done the purchases of rolling stock in lean years. It is during these years that it would be well to remind them of the advisability of these measures of precaution. What is requisite at times of crisis, owing to superabundance of traffic, is to help them through with it, and not forget above all things that crises of this kind are an inevitable consequence of the irregularity of business, that all countries suffer therefrom like ours, and that we have been far this year from being the worst hit.

The Source of Internal Tire Defects.

Sometime ago there was a breakage of two tires under passenger cars and one under a locomotive on the Paris, Lyons & Mediterranean Railroad that disclosed some interesting peculiarities, as reported by Eug. Vanderhoeym, in the *Revue Generale des Chemins de Fer*. The two car wheel tires, designated B and C, had a tensile strength of 104,155 lbs. and 102,879 lbs. per sq. in., respectively. and an elongation of 17.4 and 15.6 per cent. The original thicknesses were 3 in. and 2.28 in.; and they had been worn down to 2.2 in. and 1.8 in. at the time of their rupture. The locomotive tire had a tensile strength of 406,425 lbs. with an elongation of 15.6 per cent., and is marked A.

An explanation of the formation of the defects found in these two tires was somewhat difficult to find, for it was not easy to understand how it was possible for the cavities, that are shown in the illustrations, to exist in the body of a mass of metal that has been rolled and drawn out as these tires had been. The investigators showed, however, that the cavities were due to internal flaws in the metal. That is to say a local dislocation, produced in the mass of the casting in the form of a disc as a result of internal stresses; and that these internal stresses were themselves due to a too sudden and unequal reheating of the ingot.

The granular and crystalline appearance of the interior surface of the cavities of the two tires supported this hypothesis. The local dislocation or flaw was produced at a rather low temperature, at which the material would still preserve its crystalline structure, with the result that the surfaces of separation would still preserve this structure, and if the subsequent forging operations should tend to still further separate these surfaces, they would, nevertheless, still retain their original appearance, since the temperatures, at which this work is done, are not sufficiently high to sensibly change the structure.

However attractive or even plausible such an explanation might be it could hardly be accepted without some further proof by direct experiment. An endeavor was made to artificially reproduce a local separation of surface, in an ingot of the same form and dimension as that forming the first phase in the manufacture of the tires. For this purpose it was suggested that a very thin plate of highly refractory material be put into the mold before pouring. This was to be chosen keeping in mind the very high temperature of steel in fusion and a very well known mineralogist suggested using a certain rock crystal. It was feared, however, that a rock crystal would crumble at the instant or pouring and the experiment thus be rendered valueless. It was then suggested that a plate of mortar formed of fine sand such as that employed in the lining of crucibles be used. The mortar was reinforced with iron and the whole bound together with a refractory clay. The plate thus obtained was suspended in the mold by a wire protected with a refractory covering, and after the steel was poured in and the metal cooled it was found that the plate had been neither broken nor deformed.

This encouragement led to a more definite experiment. The cores of refractory mortar were put in a mold shaped to make a cast-steel circle exactly like the ingot for the tires. The locations of these discs were as follows: Two thin refractory plates were located in a plate passing through the axis of revolution of the slab and on radii forming an angle of 90 deg. with each other as shown at *a a*.

One plate of the same shape was placed in a plane normal to this axis, and at the center of depth of the slab as at *b*. A ball of the same refractory material was put in at *c* as representing a blow hole or shrinkage cavity. Each of these pieces was suspended in the mold by a wire about 0.2 in. in diameter, surrounded by a refractory protection. The pouring was then done very carefully so as to avoid all injury to the refractory nodules, and, after casting, the ends of holes made by the supports were cleaned out and the iron wire with its refractory jacket was withdrawn. The support on one side of Nos. 1 and 2 was easily removed but on the other side the wire was welded to the metal so that it could not be withdrawn. The spherical sand nodule was entirely removed and the others partially removed.

This heavy disc of cast-steel was then reheated and rolled into a tire of the ordinary section, and after it had cooled an examina-

Fig. 1.
Broken locomotive tire.

Fig. 2.
Section of broken car wheel tire.

Fig. 3.
Section of broken car wheel tire.

Fig. 4.
Section of broken car wheel tire.

Fig. 5.
Section of broken car wheel tire.

Fig. 6.
Section of broken car wheel tire.

Fig. 7.

Fig. 8.

Fig. 9.

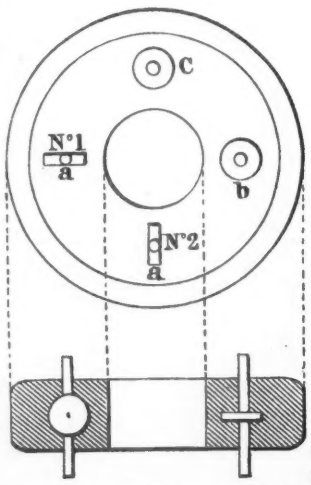
had been thus artificially created. For this purpose cross sections were cut from the tires, the left-hand side of which are shown in the illustrations. The following observations were made of the four sections:

G 3 (Fig. 6).—This section corresponds to the artificial defect at No. 1 produced by one of the plates set in the cast-steel ingot in the plane of the axis. It will be seen that under the compressing action of rolling, the interior space has opened. The length of the cavity thus produced is about 2.75 in. in the direction of rolling, and its height is practically equal to that of the original plate, or about 2.93 in. This is explained by the fact that the disc as well as the ingot had a thickness equal to the width of the tire, and that the rolling, as in the transformation of the ingot into a tire, acted only in the direction of the thickness and not in that of the width. Thus a flat space, representing a flaw, set in a plane passing through the axis of revolution of the disc, has produced a cavity of thickset form. This confirms the hypothesis as to the cause of the cavities in the original tires. Further, the two lines extending outward from the top and bottom of the cavity will be noticed. These indicate the location of the two supports of the plates.

Fig. 10.
Section of tire with artificial defect caused by a ball.

Fig. 11.
Section of defective bar forged from ingot containing a flaw.

G 33 (Fig. 7).—This section, corresponding to the artificial defect No. 2, shows that the rolling has transformed the flattened space, situated in the field of pressure like the preceding one, into a thickset cavity. This cavity has a breadth of 2.6 in. in the direction of the rolling and a height of 3.5 in., or exactly the same as the original diameter of the plate.



G 333 (Fig. 8).—This section, which corresponds to the defect B, produced by the plate set normal to the axis of revolution of the disc, and midway of its thickness, shows that the artificial flaw was compressed.

By cutting other sections 2.6 in. on either side of the first section, as indicated by Fig. 9, the same sort of cavity was found but of smaller dimensions, showing that the cavity extended over a length of at least 5.8 in., or twice 2.6 in. plus the thickness of the original section G 333, or 0.6 in.

We see, then, that a flat flaw would be crushed and elongated circularly in the direction of rolling, and it can be readily conceived that if the flaw is small enough, the amount of flattening produced by the rolling may be such as to close the cavity entirely, and leave merely a line of separation as shown in the illustration of the broken locomotive tire.

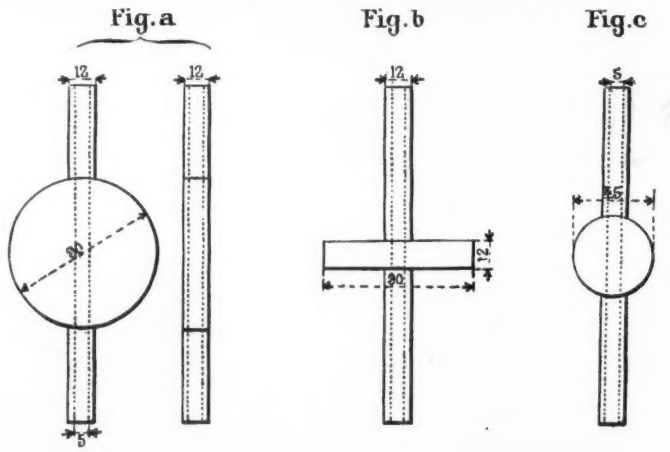
This goes to support what we have already said that a surface of separation existing in the body of a tire can produce, under the forging action a cavity corresponding to a cavity or a mere flaw previously existing in the ingot. It is to be presumed, however, that a flat flaw will be produced in the ingot, rather than in the disc, provided, of course, that it has been heated too rapidly.

G 3333 (Fig. 10).—This section corresponds to the artificial defect formed by the ball. It was found that the cavity was entirely crushed by the rolling, and that it was reduced in section to a simple line, situated on the prolongation of the lines formed by the flattening of the cavities in which the supporting bars of iron or chaplets were located. By cutting other sections on either side of the original one, it was found that the surface of separation, due to crushing of the original cavity, extended in a circle in the direction of the rolling. It may be remarked that a cavity of approximately circular form can only be produced in a casting by crushing out under a hammer a pre-existing cavity that was somewhat elongated vertically in the ingot, or by opening a vertical flaw, as may undoubtedly occur. A spherical cavity in an ingot will always be flattened under the hammer in the transformation of the ingot into a slab, and this will be found to be the case with defects of the character of a No. 1 and a No. 2, as indicated on the line engraving.

Now it will be readily understood how such cavities as those found in tires B and C, which broke in service, can be produced moreover from the experiments that have been detailed above, it must be acknowledged that an internal flaw is the most probable original cause of the formation of these cavities.

The conclusion to be drawn, therefore, is that the reheating of the slabs should be performed with the utmost care. The same precaution should be observed in the reheating of ingots, though the flaw caused by unskillful heating of the ingots seems to have a tendency to appear in the horizontal plane, causing a circular line of separation in the tire as shown in the broken locomotive tire. The consequences of this type of defect are less serious than those resulting from a defect which makes a considerable reduction in the section of resistance. More recent observations have tended to confirm the conclusions drawn from the experiments thus detailed.

At the steel works of St. Etienne an ingot weighing 3,960 lbs. of octagonal section measuring 20.47 in. at the base and 14.57 in. at the other end, cast by the Harmet compression process and consequently entirely free from cavities was forged into a bar 7.87 in. square. When this had been done a cavity measuring 11.82 in. in the direction of the length was found in the center of the bar. The interior surface of this cavity was coated with perfectly white crystals, whose form alone had been slightly changed by forging. These two characteristics, as well as the method of manufacture, by compression, make it impossible to attribute the formation of the hollow to any other cause than that of a flaw. The flaw was produced by the too rapid heating of the ingot in a plane normal to the axis so that sufficient heat did not reach the inner surfaces. The drawing out under the hammer, after having compressed this flaw, and having transformed it into a cavity, had gradually elongated it so as to form a cavity with a final length of 11.82 in. as stated.



Method of Placing Cores in Ingots to Produce Tire Defects.

The illustration, Fig. 11, shows the appearance of a section of this 7.87 in. square bar on a plane normal to its axis and through the center of the cavity.

Interborough-Metropolitan Organization.

The accompanying chart was compiled for the New York City Public Service Commission to illustrate the organization of the Interborough-Metropolitan system. But the complexity of the organization is not fully shown by the connecting lines on the chart. The

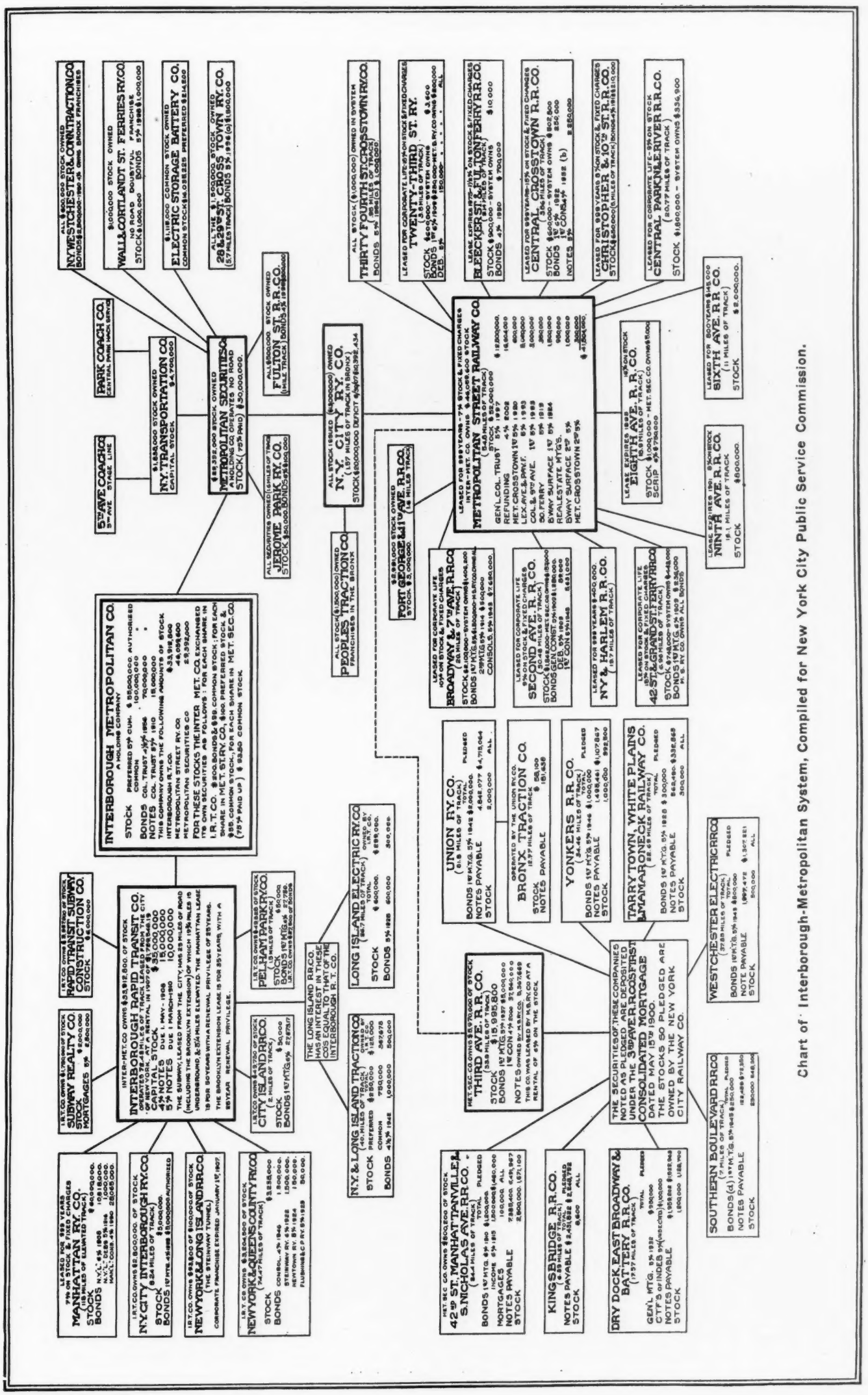
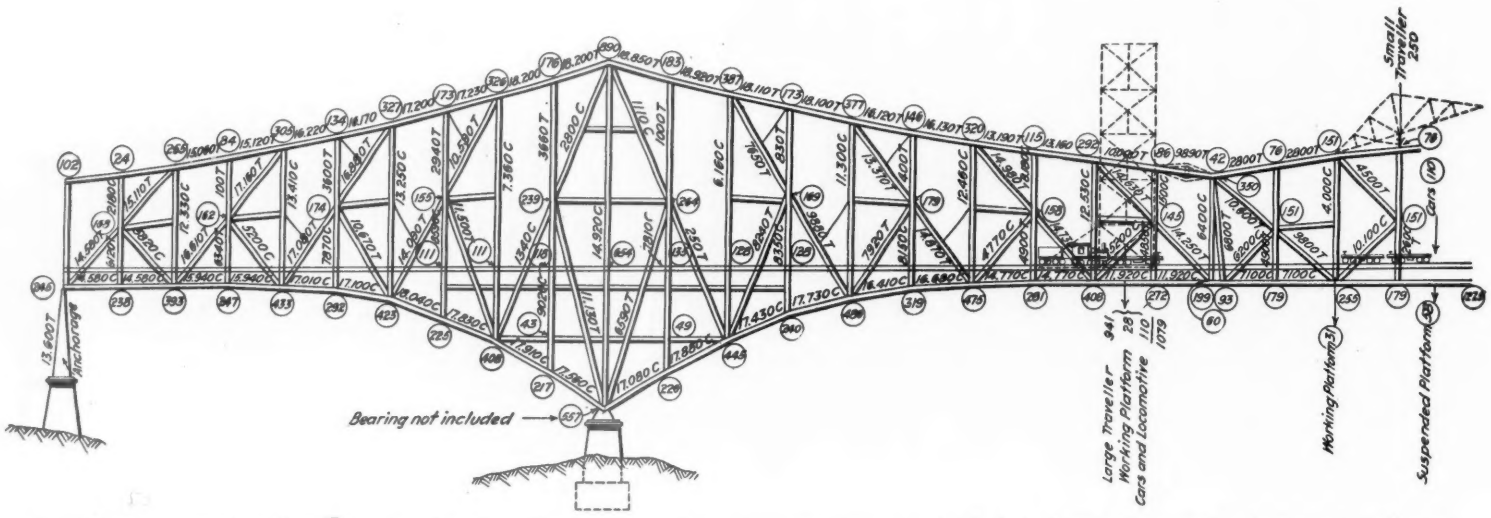

METROPOLITAN CO.
A HOLDING COMPANY
STOCK PREFERRED 5% CUM. $ 55,000,000 AUTHORISED
COMMON 100,000,000 "
BONDS COL. TRUST 4½% 1956 70,000,000 "
NOTES COL. TRUST 5% 1910 18,000,000 "
THIS COMPANY OWNS THE FOLLOWING AMOUNTS OF STOCK.
INTERBOROUGH R.T.CO. $33,918,800
METROPOLITAN STREET RY.CO. 44,058,800
METROPOLITAN SECURITIES CO $9,392,000
FOR THESE STOCKS THE INTER. MET. CO. EXCHANGED ITS OWN SECURITIES AS FOLLOWS:
I.R.T.CO. $200 BONDS & $98 COMMON STOCK, FOR EACH SHARE IN MET. STR'Y. CO, $100 PREFERRED STOCK & $55 COMMON STOCK, FOR EACH SHARE IN MET. SEC. CO. (75% PAID UP) $ 93.50 COMMON STOCK.
ALL $400,000 STOCK OWNED
NY.WESTCHESTER & CONN. TRACTION CO.
BONDS $2,000,000 1901-08 OWNS BRONX FRANCHISES
$1,000,000 STOCK OWNED
WALL & CORTLANDT ST. FERRIES RY. CO.
NO ROAD DOUBTFUL FRANCHISE
STOCK $1,000,000 BONDS 5% 1998 $1,000,000
$1,118,000 COMMON STOCK OWNED
ELECTRIC STORAGE BATTERY CO.
COMMON STOCK $4,038,825 PREFERRED $214,800
ALL THE $1,800,000 STOCK OWNED
28 & 29TH ST. CROSS TOWN RY. CO.
(5.7 MILES TRACK) BONDS 5% 1998 (a) $1,800,000
ALL STOCK ($1,000,000) OWNED IN SYSTEM
THIRTY FOURTH ST. CROSSTOWN RY. CO.
BONDS 5% 1958 (c) $ 1,000,000
LEASED FOR CORPORATE LIFE-6% ON STOCK & FIXED CHARGES
TWENTY-THIRD ST. RY.
(3.6 MILES OF TRACK)
STOCK $600,000 - SYSTEM OWNS $2,600
BONDS 5% 1909 $ 600,000 - " " $2,600,000
DEB. 5% 150,000 - " " $2,600,000 ALL
LEASE EXPIRES 1970-10% ON STOCK & FIXED CHARGES
BLEECKER ST. & FULTON FERRY R.R. CO.
(1.32 MILES OF TRACK)
STOCK $ 900,000 - SYSTEM OWNS $ 10,000
BONDS 4% 1950 $ 700,000
LEASED FOR 999 YEARS-6% ON STOCK & FIXED CHARGES
CENTRAL CROSSTOWN R.R. CO.
(3.84 MILES OF TRACK)
STOCK $600,000 - SYSTEM OWNS $ 802,800
BONDS 1ST 5% 1952 250,000
2ND 5% 1952
1ST CONS 4½% 1952 (b) 850,000
NOTES 5%
LEASED FOR 999 YEARS 6% ON STOCK & FIXED CHARGES
CHRISTOPHER & 10TH ST. R.R. CO.
STOCK $650,000 (6 MILES OF TRACK) BONDS 4% 1911 $ 210,000
LEASED FOR CORPORATE LIFE-9% ON STOCK
CENTRAL PARK, N. & E. RIVER R.R. CO.
(20.77 MILES OF TRACK)
STOCK $1,800,000 - SYSTEM OWNS $ 334,900
ALL STOCK ($1,000,000) OWNED IN SYSTEM
PARK COACH CO.
CENTRAL PARK HACK SERVICE
$ 5TH AVE COACHES
5TH AVE STAGE LINE
$1,688,000 STOCK OWNED
NY. TRANSPORTATION CO.
CAPITAL STOCK $ 4,700,000
ALL SECURITIES OWNED (1.5 MILES OF TRACK)
JEROME PARK RY. CO.
STOCK $50,000 BONDS 5% $100,000
$88,382,000 STOCK OWNED
METROPOLITAN SECURITIES
A HOLDING CO. OPERATES NO ROAD
STOCK (75% PAID) $30,000,000.
ALL $500,000 STOCK OWNED
FULTON ST. R.R. CO.
(1 MILE TRACK) BONDS 4% 1946 $500,000
ALL STOCK ISSUED ($20,000,000) OWNED
N.Y. CITY RY. CO.
(197 MILES OF TRACK IN BRONX)
STOCK $20,000,000 DEFICIT $ 5,967,566 $14,032,434
ALL STOCK ($1,500,000) OWNED
PEOPLES TRACTION CO.
FRANCHISES IN THE BRONX
$ 2,881,000 STOCK OWNED
FORT GEORGE & 181ST AVE. R.R. CO.
STOCK $ 2,000,000 (1.4 MILES TRACK)
LEASED FOR 999 YEARS-7% STOCK & FIXED CHARGES
INTER-MET. CO. OWNS $ 44,088,600 STOCK
METROPOLITAN STREET RAILWAY CO.
(54.8 MILES OF TRACK)
STOCK $ 52,000,000
GEN. L. COL. TRUST 5% 1997 $ 18,000,000
REFUNDING 4% 2002 16,854,000
MET. CROSSTOWN 1ST 5% 1980 800,000
LEX. AVE. & PAV. F. 5% 1993 8,142,000
COL. & 9TH AVE. 1ST 5% 1993 2,000,000
30. FERRY 5% 1919 250,000
BWAY SURFACE 1ST 5% 1924 1,852,000
REAL ESTATE MTGS. 956,000
BWAY SURFACE 2ND 5% 1,000,000
MET. CROSSTOWN 2ND 5% 350,000
$ 47,804,000
LEASE EXPIRES 1993 10% ON STOCK
EIGHTH AVE. R.R. CO.
(10.8 MILES OF TRACK)
STOCK $1,000,000 - MET. SEC. CO. OWNS $ 5,000
SCRIP 6% $ 750,000
LEASED FOR 500 YEARS $45,000
SIXTH AVE. R.R. CO.
(11 MILES OF TRACK)
STOCK $ 2,000,000.
LEASE EXPIRES 1901 6% ON STOCK
NINTH AVE. R.R. CO.
(9.1 MILES OF TRACK)
STOCK $ 600,000
LEASED FOR CORPORATE LIFE
BROADWAY & 7TH AVE. R.R. CO.
(20 MILES OF TRACK)
STOCK $2,100,000 - SYSTEM OWNS $1,400,800
BONDS 1ST MTG. 5% 1904 $ 800,000
CONSOL. 5% 1948 $ 7,680,000.
LEASED FOR CORPORATE LIFE
6% ON STOCK & FIXED CHARGES
SECOND AVE. R.R. CO.
(30.48 MILES OF TRACK)
STOCK $1,840,000-MET. SEC. CO. OWNS $ 920,000
BONDS GEN. CONST. 5% 1909 $ 1,250,000
INCOME 5% 1948 1,250,000
1ST CON 5% 1948 661,000
LEASED FOR 999 YEARS $ 400,000.
NY. & HARLEM R.R. CO.
(19.7 MILES OF TRACK)
LEASED FOR CORPORATE LIFE
10% ON STOCK & FIXED CHARGES
42ND ST. & GRAND ST. FERRY R.R. CO.
STOCK $ 748,000 - SYSTEM OWNS $ 448,000
BONDS 1ST MTG. 6% 1909 $ 234,000
M. S. RY. CO. OWNS ALL BONDS
LEASED FOR 999 YEARS
MANHATTAN RY. CO.
7% ON STOCK & FIXED CHARGES
(118 MILES OF ELEVATED TRACK)
STOCK $ 40,000,000.
BONDS N.Y.L. 4% 1958 10,818,000.
N.Y.L. 2ND 5% 1994 10,000,000.
MANH. CONS. 4% 1990 28,065,000.
I.R.T. CO. OWNS $2,800,000 OF STOCK.
N.Y. CITY INTERBOROUGH RY. CO.
STOCK (24 MILES OF TRACK) $ 3,500,000.
BONDS 1ST MTG. 4½% 1968 $ 3,000,000 AUTHORISED
I.R.T. CO. OWNS $982,800 OF $1,000,000 OF STOCK.
NEW YORK & LONG ISLAND R.R. CO.
(THE STEINWAY TUNNEL)
CORPORATE FRANCHISE EXPIRED JANUARY 15, 1907
I.R.T. CO. OWNS $3,234,500 OF STOCK.
NEW YORK & QUEENS COUNTY RY. CO.
(34.47 MILES OF TRACK) $ 3,235,000
STOCK
BONDS CONSOL. 4% 1949 1,800,000.
STEINWAY RY. 6% 1928 1,800,000.
NEWTOWN RY. 5% 1924 150,000.
FLUSHING & C.P. RY. 5% 1938 50,000.
I.R.T. CO. OWNS $2,500,000 OF STOCK.
CITY ISLAND R.R. CO.
(5 MILES OF TRACK)
STOCK $ 50,000
BONDS 1ST MTG. 4% $ 27,000
I.R.T. CO. OWNS $2,750,000 OF STOCK
(2 MILES OF TRACK)
STOCK $ 90,000
BONDS 1ST MTG. 5% $ 90,000
THE LONG ISLAND R.R. CO. HAS AN INTEREST IN THESE LINES EQUAL TO THAT OF THE INTERBOROUGH R.T. CO.
N.Y. & LONG ISLAND TRACTION CO.
(40 MILES OF TRACK)
STOCK PREFERRED 6% $ 500,000 $ 122,500
COMMON 750,000 28,975
BONDS 4½% 1948 1,000,000 500,000
LONG ISLAND ELECTRIC RY. CO.
(20.7 MILES OF TRACK)
STOCK $ 600,000. OWNED BY L.I. R.R. CO. $ 598,000.
BONDS 5% 1928 600,000 300,000
INTER-MET. CO OWNS $ 53,912,800 OF STOCK
INTERBOROUGH RAPID TRANSIT CO.
OPERATES 72.41 MILES OF TRACK LEASED FROM THE CITY OF NEW YORK, AT A RENTAL IN 1907 OF $ 7,238,941.19
CAPITAL STOCK $ 35,000,000
7% NOTES DUE 1 MAY 1966 18,000,000
5% NOTES " 1 MAY 1966 10,000,000
THE SUBWAY, LEASED FROM THE CITY, WHICH IS 10½ MILES OF ROAD (INCLUDING THE BROOKLYN EXTENSION) OF WHICH 15½ MILES IS UNDERGROUND, & 5.54 MILES ELEVATED. THE MANHATTAN LEASE IS FOR 50 YEARS WITH A RENEWAL PRIVILEGE OF 25 YEARS.
THE BROOKLYN EXTENSION LEASE IS FOR 25 YEARS, WITH A 50 YEAR RENEWAL PRIVILEGE.
I.R.T. CO. OWNS $ 3,000,000 OF STOCK
SUBWAY REALTY CO.
STOCK $ 3,000,000
MORTGAGES 5% $ 6,800,000
I.R.T. CO. OWNS 4 SIXTHS OF STOCK
RAPID TRANSIT SUBWAY CONSTRUCTION CO.
STOCK $ 4,000,000
MET. SEC. CO. OWNS $ 5,970,000 OF STOCK.
THIRD AVE. R.R. CO.
(338 MILES OF TRACK)
STOCK $ 15,998,800
BONDS 1ST MTG. 5% 1937 $ 8,000,000
1ST CON 4% 2000 37,845,000
NOTES OWNED BY M. S. RY. CO. 5,367,666
THIS CO. WAS LEASED BY M. S. RY. CO. AT A RENTAL OF 6% ON THE STOCK.
THE SECURITIES OF THESE COMPANIES NOTED AS PLEDGED ARE DEPOSITED UNDER THE 38TH AVE. R.R. CO'S FIRST CONSOLIDATED MORTGAGE DATED MAY 15TH 1900.
THE STOCKS SO PLEDGED ARE OWNED BY THE NEW YORK CITY RAILWAY CO.
MET. SEC. CO. OWNS $ 600,000 OF STOCK.
42D ST. MANHATTANVILLE & ST. NICHOLAS AVE. R.R. CO.
($4.4 MILES OF TRACK)
BONDS 1ST MTG. 5% 1951 $ 1,500,000 PLEDGED
INCOME 6% 1915 1,800,000 $ 1,440,000
MORTGAGES 100,000 ALL
NOTES PAYABLE 7,888,400 6.4% 507
STOCK 2,500,000 1,671,100
KINGSBRIDGE R.R. CO.
(2.89 MILES OF TRACK)
NOTES PAYABLE $ 2,431,818 $ 1,458,748
STOCK 600 ALL
DRY DOCK, EAST BROADWAY & BATTERY R.R. CO.
(17.97 MILES OF TRACK)
TOTAL PLEDGED
GEN'L MTG. 5% 1932 $ 950,000
CTF'S OF INDEB 5% (MISC. CHG.) 1,100,000
NOTES PAYABLE $ 1,958,886 $ 1,858,948
STOCK 1,800,000 1,158,700
SOUTHERN BOULEVARD R.R. CO.
(7 MILES OF TRACK)
TOTAL PLEDGED
BONDS (4) 1ST M.T.G. 5% 1948 $ 250,000 $ 250,000
NOTES PAYABLE 182,486 $ 72,350
STOCK 800,000 548,500
UNION RY. CO.
(8.8 MILES OF TRACK)
TOTAL PLEDGED
BONDS 1ST M.T.G. 5% 1948 $ 2,000,000 $ 4,715,064
NOTES PAYABLE 4,848,077
STOCK 2,000,000 ALL
OPERATED BY THE UNION RY. CO.
BRONX TRACTION CO.
STOCK (8.57 MILES OF TRACK) $ 158,100
NOTES PAYABLE 151,436
YONKERS R.R. CO.
(24.46 MILES OF TRACK)
TOTAL PLEDGED
BONDS 1ST M.T.G. 5% 1946 $ 1,000,000 $ 1,107,867
NOTES PAYABLE 1,498,461
STOCK 1,000,000 992,500
TARRYTOWN, WHITE PLAINS & MAMARONECK RAILWAY CO.
(22.69 MILES OF TRACK)
TOTAL PLEDGED
BONDS 1ST M.T.G. 5% 1938 $ 300,000 $ 448,480 $ 338,868
NOTES PAYABLE 1,895,472
STOCK 300,000 ALL
WESTCHESTER ELECTRIC R.R. CO.
(37.85 MILES OF TRACK)
TOTAL PLEDGED
BONDS 1ST M.T.G. 5% 1948 $ 800,000
NOTE PAYABLE 1,895,472 $ 1,307,221
STOCK 800,000 ALL

Chart of Interborough-Metropolitan System, Compiled for New York City Public Service Commission.

Interborough-Metropolitan Company controls the Metropolitan Street Railway Company because it owns all the stock of the Metropolitan Securities Company, which owns the stock of the New York City Railway Company, which is lessee of the Metropolitan Street Railway and guarantees dividends on its stock. But the Inter-Met. company also owns over 88 per cent. of Metropolitan Street Railway stock direct; that is to say, it rents to itself, through two brokers, a property which it already owns, and guarantees itself the rental.

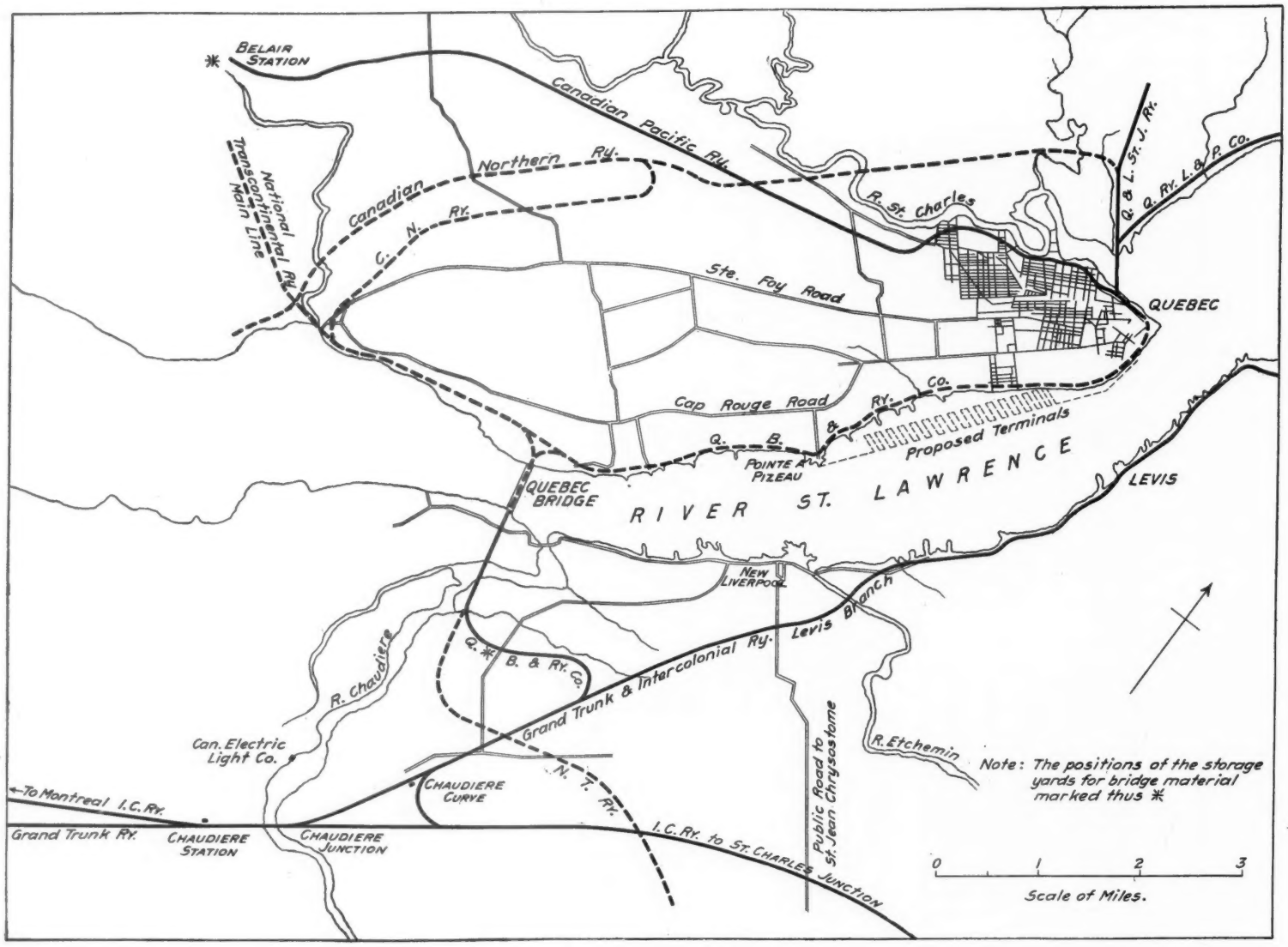
The Wreck of the Quebec Bridge.

Accompanying the report of the Royal Commission on the failure of the Quebec bridge across the St. Lawrence river were a number of blueprints illustrating the various stages of the structure and the stress sheets as calculated before and after the disaster, as well as a map showing the location and the proposed and existing railroad connections. Three of these drawings are reproduced herewith. The outline drawing of the location shows the



Note: Figures shown above thus ◯ are in units of one thousand pounds per truss and include weight of steel work only except as indicated. To these should be added 250 lbs. per lin. ft. per truss throughout entire bridge for weight of track, applied at floor line, giving a panel weight for Anchor Arm of (12.5) thousand per truss, and for Cant. Arm and Suspended Span of (14) thousand per truss.
In the unit stresses C = Compression and T = Tension. Figures from calculations of Phoenix Bridge Co. and verified by independent calculations by C. C. Schneider, Consulting Engineer.

Stress Sheet of Quebec Bridge at Time of Collapse.

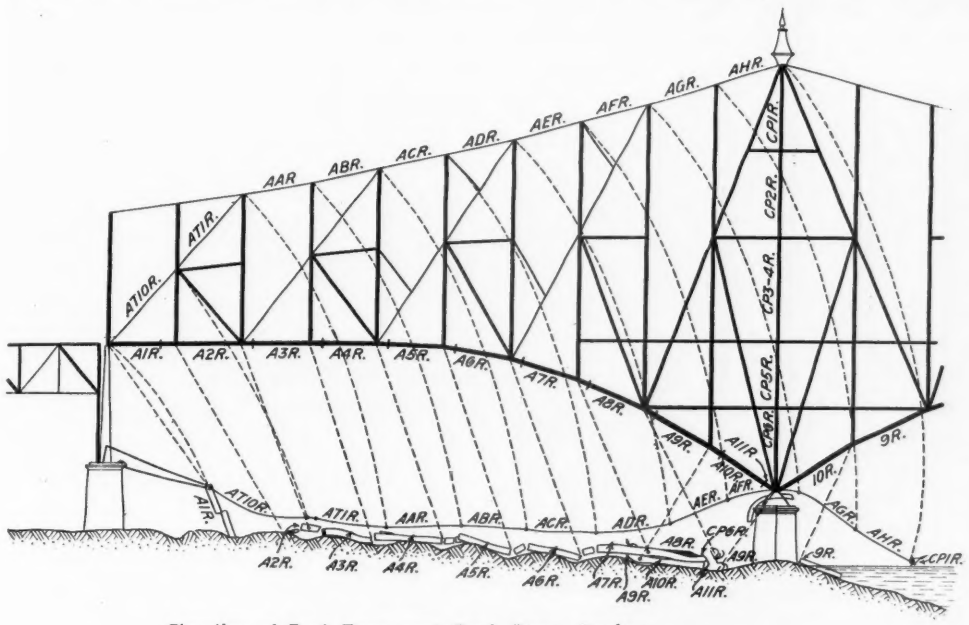


Location of the Quebec Bridge.

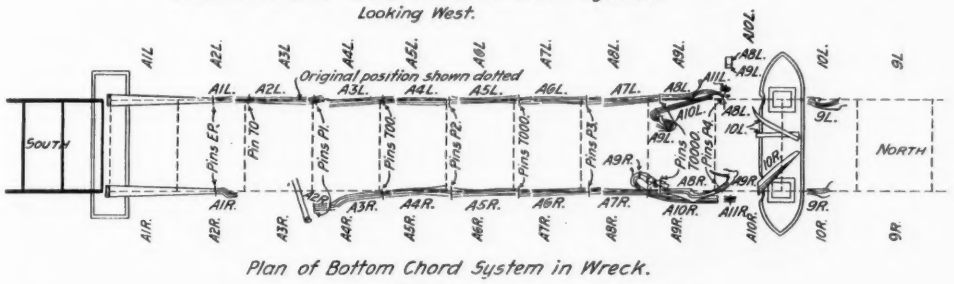
position of the bridge with reference to Quebec. It is above the city and somewhat remote from the existing lines centering in the city. The crossing was to have been effected at the narrowest part of the river, about six miles above the point upon which the city is situated and nearly opposite the mouth of the Chaudiere river.

The stress sheet of the bridge is that calculated as existing at the time of the collapse with the locomotives, cars and travelers in position. This is fully self-explanatory and shows very clearly the conditions prevailing.

The diagram of the course of the members in falling is interesting, as indicative of the method of failure, and as conveying some slight idea of the probable entanglement of the mass of wreckage



Elevation of East Truss and East Truss System.
Looking West.



Plan of Bottom Chord System in Wreck.

Course of Bridge Members in Falling.

that lay strewn on the ground immediately after. Accounts published at the time indicated that the inextricable confusion of this pile of debris was almost beyond the power of imagination.

The Ocean Carrier.

BY J. RUSSELL SMITH, PH.D.

XVI.

Trans-Atlantic Freight Rates and Their Control.—I. The Lines Between America and Great Britain.

There is probably less organization and less general rate agreement among the carriers in the trans-Atlantic trade than in any other in the world.

All other important ocean trades differ from the North Atlantic in at least three respects: (1) none is so large and none is over so short a route; (2) none has such geographical unity on one end, making competition easy, nor so many nationalities on the other end, making agreement difficult; (3) none is so dependent on raw materials.

1. The first cause is a dual one producing one effect, many carriers. The shortness of the route permits a comparatively few vessels to render line service, while the magnitude of the Atlantic trade requires so many lines that they have never been able effectually to get together. The trade from America or from Europe to the commercial districts of other continents is smaller in volume and over routes so long that the formation of a line is relatively more difficult, and therefore the task of starting new competition is greater. Competition in line traffic, it should be noted, requires another line able to offer the same service. The trans-Atlantic voyage is but one-half to one-fourth the length of that from Europe or America to South America, South Africa, India, Australia or the Orient.

The stupendous size of the trade from America to Europe puts it almost or quite beyond the limits of what the human mind can grasp, control and weld into an agreeing whole. In 1902 when the International Mercantile Marine Company was forming it was stated that this trade was giving employment to about three million tons of shipping. The Morgan interests succeeded at great financial sacrifice in getting possession of but one-third of this, and with it they met losses for several years that threatened to engulf them. The remaining two million or more tons of shipping working here are possessed by many owners having little common interest.

2. The geographical and political conditions of America tend to weld the commerce of that continent with any particular part of Europe into one great unit by enabling it to reach the sea anywhere.

For this trade the United States and Canada are one. American goods go down the St. Lawrence, and Canadian goods go out by United States Middle Atlantic ports. The peculiar geographic form and transportation conditions of the center of North America make easy the access from the central region to the sea at any point between Montreal and New Orleans and Galveston. If Montreal rates do not suit, the shipper in the central basin will turn to Boston, or New York, or Philadelphia, or Baltimore, or Newport News, or New Orleans. The trans-Atlantic traffic is, at its American end, one traffic despite the variety of the geographic factors involved in the trade of all America with all Europe, and a rate agreement to be successful must cover the whole. Possibilities of effective combinations are very different in a trade like that from the same coasts to Australia, which requires five or six steamers per month all from one port instead of 15 or 20 per day from a long row of rival ports.

There is in Europe no such commercial unity. European land forms, politics and transportation conditions unite to produce commercial separateness. A half dozen different nations, each commercially independent and commercially hostile, give to the trade of Austria, Italy, France, Great Britain and Germany an isolation that is entirely unknown in America and make much easier the agreement of European carriers to the different corners of the world, because each group of carriers has a territory of origin in which rivals cannot compete without coming to the same ports.

The lack of any geographic or commercial unity in Europe corresponding to that in America, causes the carrying trade with America to fall at its eastern end into three main divisions: (1) the United Kingdom; (2) the Continent; (3) the Mediterranean. The trade of each of these divisions with America makes a commonly used unit in rate problems and plans, although they sometimes apply to the smaller unit of the carriers to a certain European port.

3. The longer European and American trades stand apart from the trans-Atlantic, having less raw materials and more manufactures in their freight. The great quantities of manufactures going out from Europe require a fast, frequent and reliable service over long routes. Lines agreeing and co-operating can easily give such service, which, moreover, a new rival finds it hard to give. Competition from Europe to the more distant continents cannot, therefore, be so active a force as it is in the European trade with eastern North America.

The greatest factor of confusion in trans-Atlantic rates is grain, the great staple commodity in the trans-Atlantic cargo. To begin with, this is essentially charter vessel cargo and the liner that gets it must bid down to do it; hence the rate is constantly lower on line than on charter vessels. The line vessels make this sacrifice of space because grain serves as good ballast. A certain amount of it brings the ship down to her intended draught and causes her to sail better. In connection with higher class freight the difference is that between profit and loss. Grain, therefore, brings the line vessel in direct competition with the tramp. If grain is abundant, the ships can usually fill up at good rates; but if it is scarce, many of the ships must have it at any price. There are cases on record of grain being carried for nothing. With such an imperative demand rate agreements are difficult to enforce. The frequent fluctuations in the grain supply are familiar to all. The shipping on the Atlantic must be able to handle, when it comes, the large surplus above America's growing requirements. This surplus varies. In 1904 the grain and flour exports from the United States to Europe amounted to about four and a half million tons.

The preceding year the same commodities furnished seven and one-half million tons of freight. Since the grain trade is irregular in quantity, it renders the trans-Atlantic trade hard to organize through rate agreements. The fact that the unit of shipment is large, usually tens of thousands of bushels, gives the smallest fraction of rate difference a deciding influence.

In a trade as great as that across the Atlantic there are possibilities of numerous small agreements which have limited scope but can yet do something to steady conditions in given grades of exports and benefit shipper and carrier alike. It is possible for two lines from the same port to have some kind of an understanding, and it is possible for the carriers to any one European port to get together, as do the London and Liverpool carriers. This is made easy and almost necessary by the fact that nearly all the freighting arrangements and final bargains for the New York lines are made on the floor of the Produce Exchange by freight brokers representing the shippers, and the agents or representatives of the steamship lines. Not only are New York freight bargains, and therefore rates, made there, but nearly every steamship line sailing from America, whether it be from Montreal or Galveston, is represented. Most of the important American railroads also have representatives there trying to get seaboard work for their lines. It is therefore physically easy for the representatives of any group of traders to get together, and temporary agreements without number have been made and constantly are made.

The carriers are always seeking agreement rather than competition. Where two principals of competing services send their representatives on "change" in the daily search for freight, it is with instructions to get the best rates that can be obtained, to work together to that common end and not rashly to disturb rates for the sake of a small lot of visible freight, as this causes dissatisfaction among shippers in addition to reducing income. Sane business methods demand as much.

The freight market is governed in the main by supply and demand, but the minor adjustments are made by continuous conference. One agent on the floor of the exchange says to the representative of a rival line: "We are holding for 8s. on flour for next week's sailing. What are you booking for?" "Seven shillings 6 pence." "Well, you are making a mistake, you had better hold for 8s." "All right, we will, if we can." A day later the second party may announce to the first that he is not getting any flour at 8s. and may declare his intention to quote a 7s. 6d. rate. The first may or may not adopt the same rate, but for one day at least there has been an attempt at an understanding. Not a stroke of writing is involved, no contract, no penalties, no time limit, and there is perfect freedom of secession. The traders to any city or country may get together daily or weekly and make agreements to last till the next meeting. Sometimes the agreements are more formal and may last for a considerable period, but their existence at best is precarious. For example, about 1880 there was a Liverpool agreement (minimum) on grain along the Atlantic seaboard. Port by port it was broken at all the "out ports" but still stood at New York until at last a firm of brokers bought a steamer badly in need of repairs which were to be made in England. She could get no freight at the agreed minimum and her owners cut the rate a farthing, took the cargo and ended the agreement which had until that time been observed.

It is more than accidental that the name of an ocean freight agreement is a "conference" as the "South African Shipping Conference" or the "Trans-Atlantic Shipping Conference." The name is indicative of the method of formation and often of the actual result. There has been a "Trans-Atlantic Shipping Conference" since 1868. As the date indicates, it was the outgrowth of the disturbances of the American Civil War and of the final triumph of the steam lines over the sailing lines in this trade. This conference has attempted little in the direction of the formation and regulation of rates. It has busied itself with numerous other matters of importance to all Atlantic carriers. For example, it has worked for changes in the printed form of bills of lading for the benefit of the carrier; it has secured a practically uniform bill of lading; it negotiated with the National Lumbermen's Association for certain improvements in the method of receiving and inspecting lumber for export; it acts in behalf of all in regard to legislation on quarantines, channels, etc. In 1902 this conference, with operating headquarters in New York, was made the mechanism for carrying out a minimum freight agreement to the United Kingdom which was made in Liverpool and planned for the relief of all interests. The trans-Atlantic carriers were suffering from a rate depression which in 12 months had cut their earnings from exceptional prosperity to hopeless loss. At one time this agreement included 46 lines and services.

The rate agreement involves of necessity a rate classification—a task beset with difficulties. One commodity may be incidental to one line and fundamental to another. For good loading and best income a ship must have a mixture of heavy and light goods. A ship full of wooden ware or furniture would ride high in the water with unused buoyancy. She would even be in grave danger of overturning. A shipload of steel rails would leave three-fourths of the hold space absolutely empty. By combining these two classes of freight a ship can carry at one time three-fourths of a full cargo of rails and three-fourths of a full cargo of light goods, and at the same time be in the best possible shape for safe navigation. This advantage of mixed cargo gives the loading agent a perennial but ever-changing problem. He is seeking some particular kind of freight to complete a ship's cargo; having already made enough contracts for light goods, he wants a thousand tons of heavy cargo to make the ship ride well. He must have it, and it may be that the contracts already made provide almost enough income for the voyage. He would willingly, therefore, cut the rate to get heavy cargo. But there stands the agreement, and the heavy goods can only be had at forbidden rates. The next month his desire may be to sacrifice on light goods. The attempt to lay down a classification for the numerous lines and services results every day in some firm having a strong desire to break the rate on some commodity, and in the course of time every shipper desires at some time to break almost every rate.

Shipowners are not prone to make public the details of their little-known business and it is fortunate for the writer's purpose that the Atlantic Shipping Conference got dragged into the Interstate Commerce Commission hearings on differential rates to the various Atlantic ports. The detailed history of this agreement as narrated in testimony before the Commission* reads like a description of an attempt at making ropes of sand. The original agreement, made in Liverpool, January, 1902, was signed by nearly all lines plying between the Atlantic seaboard and the United Kingdom, and the testimony showed that, at the beginning at least, the same rates were observed by lines, not signers. The agreement showed its inherent weakness by providing that:

> Any of the signers may withdraw from same at the expiration of fourteen days after the receipt by others of his or their desire to do so, and the withdrawal of one shall *ipso facto* release the others from their obligations under this agreement unless they may otherwise determine.

The inherently competitive nature of their business drove the companies to this device of unanimous consent to any action, and unanimous consent, as may easily be seen, reduced the sphere of action to small proportions, but without it no agreement was possible. The life of the agreement was one rapid series of adjustments and readjustments, concessions and compromises, made necessary to heal the dissatisfaction of some line which had served notice of its intention to withdraw. Finally, after an existence of two years and four days, a break in rates brought about such a condition that the final meeting of the conference found that there was no proposition upon which they could unite, although several of the many attempts were negatived by the votes of but one or two lines. The agreement was thereby ended, but the carriers to London met again the same day and continued the agreement so far as the American trade to that port was concerned.

During the life of the general agreement the committee of management had frequent meetings in New York and some changes were effected by correspondence through the secretary's office. Rates were promulgated for trial during two or three weeks, and the life of the agreement was continued from meeting to meeting. These extensions never covered so much as one month, and one week was the more common period of their duration. The rates were fixed with differentials to make living conditions for all ports. This included the right to adjust out of the rate any marine insurance differences between the port in question and New York and Boston. From time to time difficulties arose and concessions in rates would be granted, permitting the carriers from a certain port or ports to cut the rate a certain amount to secure a prescribed maximum amount of named articles of freight in order to get ballast, after which the usual rates were resumed. The converse of this was also practiced when lines from certain ports refused by agreement to carry certain commodities for a period so that other ports might get their share. This refusal to carry was brought about by the mere quotation of a rate sufficiently high to drive the freight to the ports agreed upon. Witnesses stoutly maintained that there was no percentage division of traffic, and minutes placed in evidence showed that the following motion was lost at the last meeting of the conferees: "That a committee be appointed to arrive at some equitable way of dividing the results of the traffic, if not by a physical division, then by pooling the earnings."

Special agreements to change temporarily the conditions of shipment from certain American ports were duplicated by similar agreements concerning the carrying of goods to certain of the European ports. The agreement covered only named articles; the list was occasionally changed, or the rates on single commodities altered. At times the desire to compete would be gratified by withdrawing the agreement on some article or articles for a named period, and when the London agreement succeeded the general agreement, February 4, 1904, it postponed the enforcement of its rate on flour until May 1. It must be borne in mind that these rates were minimum rates only. Higher rates were always hoped for, and in at

*Differential Freight Rate Case 746, N.Y., Vol. 1, May 18-20, 1904, pp. 303-502. See also N. Y., Vol. 2, June 20 and 21, pp. 1002-1042.

least one case they were definitely recommended by the conferees. The changing nature of ocean rates and the method of their making is indicated by the telegram from the Allan line at Montreal to the secretary of the conference, stating that "We are accustomed to revise our rates weekly on Fridays, in conference with the other lines (at Montreal). The rate on sacks (flour) to Liverpool will be discussed to-morrow, and the result will be communicated to you by telegraph."

In summary, it may be said that the minimum freight agreement did control rates from the Atlantic seaboard to the United Kingdom for two years. The agreement practically covered only articles essentially requisite as ballast cargo. The owners aver that they intended by this so-called minimum agreement to lay down the principle that they would rather not carry than go below the rates they named. To show the economy of trans-Atlantic service it is only necessary to state that the minimum on flour was 8.44 cents per 100 lbs., and on provisions (meats) $2.50 per ton.

Even this feeble minimum freight agreement was rendered nugatory by the American railroad differentials between the interior and the seaboard. Montreal, Philadelphia, Baltimore, Newport News and Norfolk have since the early eighties, as a result of railroad agreements, had a lower rate on heavy articles than New York, Boston or Portland. The ocean freight agreement had this differential to deal with. In the beginning the full differential of 3 cents per hundred on flour was equalized by adjusting ocean rates, thus establishing a common through rate to Europe via all ports. Later the inland differential was reduced gradually to one-half, but it was on this point that the 1902 agreement was wrecked. The end was due to the demand of a Boston line for full equalization in through rates by ocean adjustment. This was declined by a line from Baltimore, which refused to submit to sea differentials that absolutely wiped out the advantage of those by land.

As stated above, the disruption of the general agreement in February, 1904, was not the end of the practice of rate agreements. It was the end of the service of the Trans-Atlantic Shipping Conference as the means for conducting a rate agreement. The general federation broke up into practically the component parts that had formed it, and these went on as before. The London traders met immediately and continued the agreement so far as it affected them and their agreement is still in operation. The Glasgow traders and various other traders after the general break gathered themselves together as before and made and informally maintained their agreements. Forty-six services, embracing all the complications of the trade of a continent, were too many to be harmonized under one management, at least at the first attempt.*

A complicating element in any such rate agreement as that described above is the ownership of steamship lines by railroads. The Canadian-Pacific openly owns a trans-Atlantic steamship company and other trans-Atlantic lines are practically in the same condition. These lines are particularly hard to satisfy in any ocean rate agreement because the motives of their managers differ from those dominating the purely ocean carriers. The railroad steamship line (see chapters printed Feb. 21 and Feb. 28) is merely a feeder to the vastly more valuable railroad. The combined management can easily afford to lose some money on the ships to get more freight for the railroad. Private car lines and their mileage rebates and other indirect cuts in through rates have also entered in as factors here. The result is that satisfactory agreements are made with extreme difficulty between steamship lines that are *bona fide* investments and those that are mere props to a modern American railroad system.

This adjunct line—an ocean carrier with different and additional motives for cutting rates—has moreover easy means of hiding its policy. For practical purposes the through rate from the inland point to Europe may be easily cut. The other steamship lines may remonstrate, and be informed that the ocean rate is being maintained. This may be literally true; but since the railroad and the steamship line are financially one, a cut in the railroad rate has had the same effect upon competitors as a reduction in the steamship rate.

An effort at rate control was the fundamental motive back of the formation of the International Mercantile Marine Company. It was also intended to effect savings through consolidation but the control of trans-Atlantic rates was the most pressing point. During the period of the Boer war, ocean rates everywhere were prosperously high and all carriers made unwonted dividends and added phenomenal sums to their reserve funds. In the spring of 1901 rates went down to the loss point, and with large ship-building operations still in progress there was no relief in sight. Early in 1902 the minimum rate agreement was made, but it was never counted upon as a dividend earner. It was made merely to prevent rates from sinking below the cost of handling in and out of the ship. During this same winter and spring the Morgan combination was in process of negotiation and formation. The aim was to make it as large as possible; large enough to exercise, with the aid of its German allies, a controlling, supporting and steadying influence on rates for both passengers and freight. There was apparently no idea of excessive monopoly rates, but there was great confidence of easy control and of avoiding rapid fluctuations and the low points of depression that had at recurring intervals been bringing loss. The path to this goal was beset with difficulties. In the first place, some of the lines that were bought could be secured only at extravagant prices, and the capital was still further increased by stock-watering in the style of franchise-tenure finance. The Cunard line, one of the greatest factors in the North Atlantic and from this distance apparently an essential to the success of the venture, could not be bought because the stock was in strong hands. The alarmed British nation came to the rescue with new mail contracts and loans at low rates for new and faster ships. The general public thought this was a great aid to the Cunards. Some of the New York leaders in trans-Atlantic shipping think that the government agreement is a handicap to the Cunard line because in consequence of it $13,000,000 is tied up in two ships fastened to one route, and that a route of declining supremacy. The two great subsidized German lines, with the personal backing of the Emperor and the strong financial and moral support of the rest of the government, appear to have been impressed by the promising force of the new undertaking. They made an offensive and defensive alliance with the combine, and later joined with it in the purchase of the Holland-America line, leaving the French line the only continental interest of the first rank remaining outside, and with it they have apparently since concluded a firm alliance.

As a rate controller the great corporation of Mr. Morgan and Mr. Griscom has been a failure. Ocean rates showed no indication of new influences in the autumn of 1902 when the new company went into operation. The combine and its allies have had to deal with a world condition of depression in ocean rates, and they have had the lively competition of the Cunard line, which has had a more independent attitude than any of the other and smaller independent lines. It is an old, well-established, conservatively financed and admirably located line, which is in a position to hit back with equal or better force after every move the Mercantile Marine or their associates may make in competition against it. The fast services of the combine are rivalled at Liverpool by that of the Cunard, and the continental emigrant business is drawn off at the Adriatic side door. The Cunards could not be absorbed at formation, they have not been coerced by competition and rate wars, and the conditions of truce under which the rivals have at times been acting in the intervals do not seem yet to have reached a basis for long duration. In addition to Atlantic competition, the International Mercantile Company, which is essentially a carrier from Atlantic ports, has had to meet the vigorous and uncompromising efforts of the Illinois Central and other Gulf railroads in building up Gulf commerce in bulk goods at the expense of the Atlantic ports.

(To be continued.)

*Space prohibits any detailed narration of the agreements and wars in the trade of the United States with the Mediterranean. It is one series of changing episodes similar to those that have been narrated in connection with other trades.

New Tracks and Signals at Broad Street Station.

The Pennsylvania Railroad has just completed the lengthening of the platforms in its Broad street terminal station, Philadelphia, by which the most important ones are made about 1,000 ft. long, and has entirely rebuilt the signals and signal apparatus of the station and its approaches; and has sent out photographs showing the principal features of the new plant, which are reproduced herewith. The signaling embraces five important new features, as follows:

1. The use of track circuits to lock the switch levers, and the complete elimination of mechanical detector bars (or "locking bars"). These track circuits, like those installed at Hoboken, N. J., and described in the *Railroad Gazette* of January 31, last, are arranged so as to lock all switches in a route when a train passes the signal governing that route. Each switch is released behind the train as the train clears the track circuit protecting that particular switch.

2. The use of small electric lights on the interlocking machine in connection with the switch levers, to indicate the passage of a train over a track circuit. Lights also show when each signal is free to be cleared.

3. Signal arms moving in the upper quadrant.

4. The use of "three-position" signals. Horizontal indicates stop; inclined 45 degrees is used to indicate that the train has a clear track, but must expect to stop at the next signal; and an arm standing upward vertically indicates that the track is clear and also that the next signal is clear. The speed limit is 15 miles an hour, so that a single arm can be and is used to indicate for all of the routes leading from a given signal. The short arm fixed 12 ft. below the high arm, is used for movements where the speed of the train must be kept absolutely under control. The short arm is never raised except to the 45-degree position.

5. All high signals are semi-automatic. Every arm goes to "stop" immediately on the passage of a train, and it cannot be

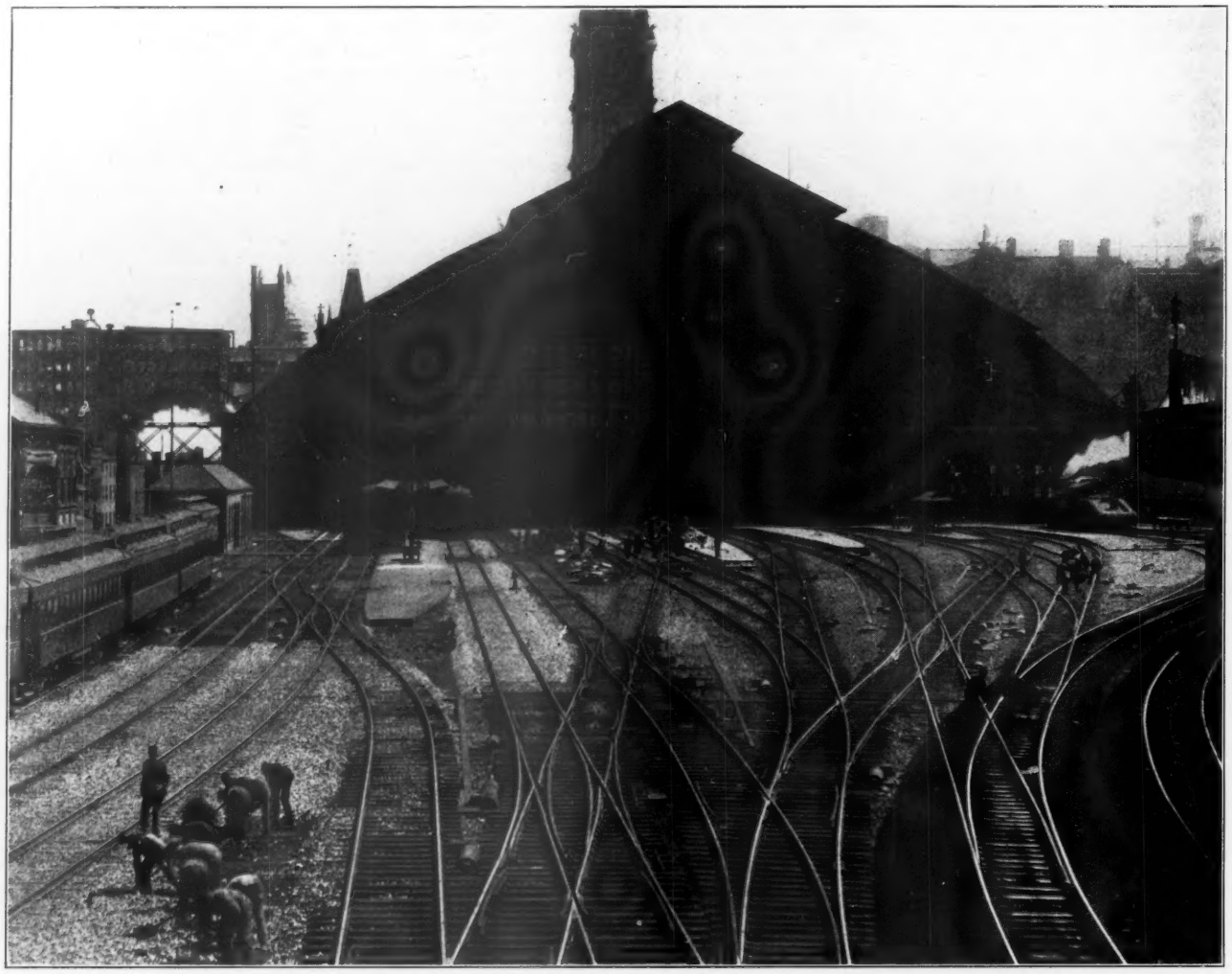


Fig. 1—Outside of Broad Street Station, Philadelphia, Looking East.

Five of the platforms have been lengthened. That at the left is covered for a part of its length, outside the train shed, by a "butterfly" roof. A building was removed to admit of the extension of the tracks at the extreme right. In the foreground are seen double slip switches without detector bars.

cleared until (a) the train has cleared the track circuit controlling that arm, and (b) until the lever has been put back normal. Thus all signals can be kept in the stop position, except as the signalman clears them, and he must clear the signal for each and every train movement.

The signal plant is electro-pneumatic, as before. There are 42 signal levers working 100 signals and 47 levers working 158

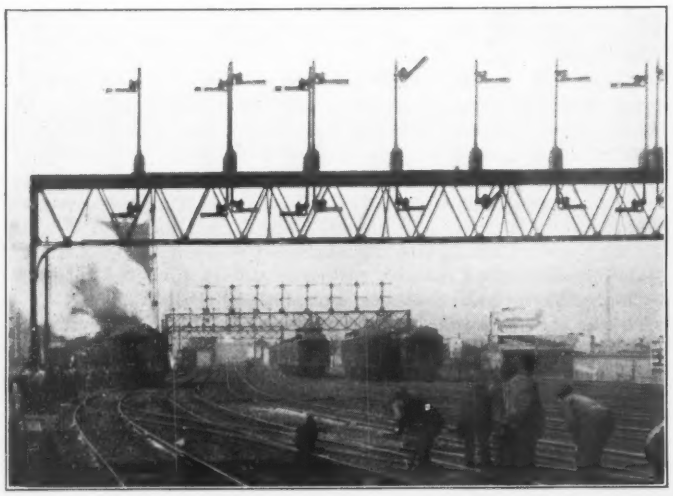


Fig. 2—Broad Street Station Looking West; Three-Position Signals, Upward Inclination.

Only one high-speed signal-arm on each post. On the signal bridges in the distance the old signals are still in use.

switches, frogs and facing-point locks. There are in the plant 434 relays and about 800,000 ft. of electric conducting wire. The train-shed tracks will now accommodate 250 cars in the aggregate, as compared with 80 cars before the enlargement, and the shortest tracks are now 750 ft. long, while under the old arrangement the minimum length was 350 ft. The regular movement in and out is now 568 trains each week day. In the last five years the traffic at this station has increased 8 per cent. annually, and in 1907 the number of passengers, in and out, was 21,318,589.

Fig. 3—Nine Tracks on Viaduct Leading to Broad Street Station, Pennsylvania Railroad, Philadelphia.

Two ladders connecting eight of the tracks; double slips at all crossings.

GENERAL NEWS SECTION

NOTES.

The Erie canal is to be opened May 5.

F. A. Delano, President of the Wabash, has been chosen President of the American Railway Association.

At Chicago last Wednesday Judge Kohlsaat in the United States Circuit Court enjoined the five principal express companies from issuing franks or carrying interstate commerce in exchange for franks.

At a hearing before the State Tax Board at Indianapolis, Ind., April 15, an officer of the Standard Oil Co. testified that in the last year the business of the Union Tank Line had resulted in a net loss of $169,073.

A Chicago press despatch says that the Chicago Subway Company has lost the mail contract, and that the government will restore the old system of horse and wagon transportation between the post office and the railroad stations.

The New York Public Service Commission, First District, has begun proceedings to impose a fine of $2,400 on the Brooklyn Rapid Transit Co. for noncompliance with an order of the commission requiring that a wrecking car be kept at the Brooklyn Bridge terminal.

Canadian papers report that the number of emigrants going into western Canada is now the largest ever known, most of the people being bound for Saskatchewan and Alberta. Five special trains passed through St. Paul in one day. Home seekers are going to Canada from Iowa, Nebraska, Kansas and Oklahoma, and thousands are coming from Great Britain.

At the Master Mechanics' Convention at Atlantic City, June 22-24, the Committee on the Apprenticeship System will exhibit models, drawings and photographs to show the rapid advancement which is being made in this phase of railroad activity. The Central of New Jersey, the Grand Trunk, the New York Central Lines and the Atchison, Topeka & Santa Fe will be represented.

The New York, New Haven & Hartford is now using electric locomotives between New York and Stamford, 33½ miles, on some of its through express trains. The trains running through between New York and Boston are hauled between Stamford and Boston, 199 miles, by one engine without change. Most of these runs take five hours or less, and the enginemen run five days in a week.

A press despatch from Helena, Montana, says that residents of the town of Big Timber, in that state, which was almost entirely destroyed by fire in March, have been notified by the Northern Pacific that they will be paid 50 cents on the dollar by the railroad toward their losses. The fire started from a spark from a locomotive and left hundreds of people homeless. This action of the railroad was voluntary.

Superintendent R. T. Morrow, of the Pittsburgh division of the Pennsylvania, has directed that circulars issued to trainmen announcing changes in tracks, switches or signals must hereafter show the new or changed part of the plant in red ink. It appears that there have been cases where an order was not fully understood, and the explanation proved to be that the employee had not fully comprehended the diagram of the tracks.

At Chicago last week the United States circuit court, on the application of the Beatrice Creamery Co. and others, issued a temporary injunction forbidding a proposed advance in freight rates on milk and butter to the Atlantic seaboard. The increased rates had been announced by the Michigan Central, the Grand Trunk and the Pere Marquette, and these companies are accused of conspiracy to raise rates in violation of the Anti-trust law.

Artesian wells have been successfully bored at Suwanee, Valencia county, N. Mex., on the Atchison, Topeka & Santa Fe, on land which belongs, under an old land grant, to the St. Louis & San Francisco. Every alternate section for some distance along the line of the Santa Fe in this region belongs to the St. Louis & San Francisco, which owns about 450,000 acres of land in this region, all of it supposed to be arid until this recent discovery was made.

The New York State Public Service Commission, First District, has issued an order to the Receivers of the New York City Railway specifying in detail the number of surface cars which the state will require to be run on the Twenty-third street crosstown and two other New York City lines. Inspectors of the commission will estimate the probable number of passengers desiring to board the cars at the principal points during various 15-minute periods of the day, and the road is called upon to provide seats for 10 per cent. more than the estimated demand. If the demand should be such as to require more cars than the track or street will accommodate, the company must run as many cars as can be accommodated.

According to press despatches from Washington, the Attorney-General has issued a circular intended to gather complete information throughout the country concerning the ownership by railroads of commodities such as coal, lumber, etc., which, according to the Act of 1906, it will be unlawful, after May 1, for the railroads to transport, except for their own use. Congress is expected to pass a resolution under which the constitutionality of this law, forbidding a railroad to transport its own products, can be tested without requiring a road to run the risk of incurring enormous penalties.

"Pay-as-you-enter" cars have now been in use on the Madison and Fourth avenue surface street line in New York City for several weeks, and the general manager of the line says that they are proving satisfactory to the passengers and to the company. The entrance, with a very large platform, enclosed, is separate from the exit, and 20 or more passengers can board the car and then pay the conductor after it has been started. The cars carry large placards requesting passengers to have the exact fare ready, and passengers are complying with this request. There are 155 cars in service on this line, providing considerably greater passenger capacity than has ever been provided on this line before.

Bonds and Notes Maturing in 1908.

Analysis of the outstanding funded obligations of the principal railroad systems of the country reveals the fact that between now and the end of the year there will mature only about $24,000,000 of bonds, very few, if any, of which will require the issuance of new securities for refunding purposes.

It is unquestionably a fortunate circumstance that during a year when requirements for other purposes are running up to considerable amounts, the railroads are under the necessity of arranging for a smaller amount of maturing obligations than they have been in the past four or five years. The nine largest maturing issues are as follows:

Chesapeake & Ohio 1st 6s, series A and B	$2,013,354
Erie-Buffalo & S. W. 1st 6s	1,500,000
Erie-S. W. Div. 5s	1,000,000
Maine Central-Portland & Ogdensburg 5s	2,119,000
Pennsylvania-Ashtabula & Pittsburgh 1st 6s	1,500,000
Kansas City, Fort Scott & Gulf 1st 7s	2,103,000
Alabama Great Southern 1st 6s	1,750,000
Utah & Northern 1st 6s	4,993,000
Fitchburg 5 per cent. plain bonds	2,000,000

With regard to short term obligations of the total amount of about $115,500,000, whose maturities fall within the current year, something over $52,000,000 yet remains to be taken care of. Most of these are in considerably larger amounts than the maturing bonds, and will require financing of some sort. Since the arrangements made by E. H. Harriman to pay off the $5,500,000 Erie discount notes, which fell due on the 8th inst., and the action of the Public Service Commission in granting permission to the Interborough to issue new securities to refund the $15,000,000 notes maturing on May 1, the following are left unprovided for:

Cincinnati, Ham. & Dayton 4½s, due September 1	$15,000,000
Detroit, Toledo & Ironton 5s, due December 1	5,500,000
St. Louis & San Francisco 4½s, due December 1	7,013,831
Underground of London 5s, due June 1	16,550,000
Wheeling & Lake Erie 5s, due August 1	8,000,000

In addition to these short term obligations, Delaware & Hudson has a bank loan of $6,000,000 maturing about August 1, which will in all probability be paid off from the proceeds of the new bonds which the stockholders are asked to authorize at the meeting next month.—*Wall Street Journal.*

Improved Street Car Service on Brooklyn Bridge.

The New York State Public Service Commission, First district, reports that since September last there has been a material diminution in the number of delays of trolley cars on the New York and Brooklyn bridge, and that there has been a large increase in the number of cars in service, particularly in the rush hours. The time of delays has been reduced from 1,060 minutes in September to 385 minutes in March.

During the month of March 133,000 surface cars crossed the bridge, being an increase of 11,000 over the preceding September, which means that about 396,000 more seats were provided in March than in September. The average number of surface cars passing over the bridge in September in the evening rush hour was 288. In March this average was increased to 310.

At this time one year ago the largest daily number of surface

cars that crossed the bridge was approximately 4,000. Now it is approximately 4,700, an increase of 17½ per cent. At this time a year ago the average number of surface cars crossing the bridge between 5 and 6 p.m. was 236. Now it is 310, an increase of 33⅓ per cent.

The Commission has ordered, and effected, many improvements in cars, reducing the delays from defects, and has secured the exclusion of heavy wagons from the bridge roadways during the rush hours.

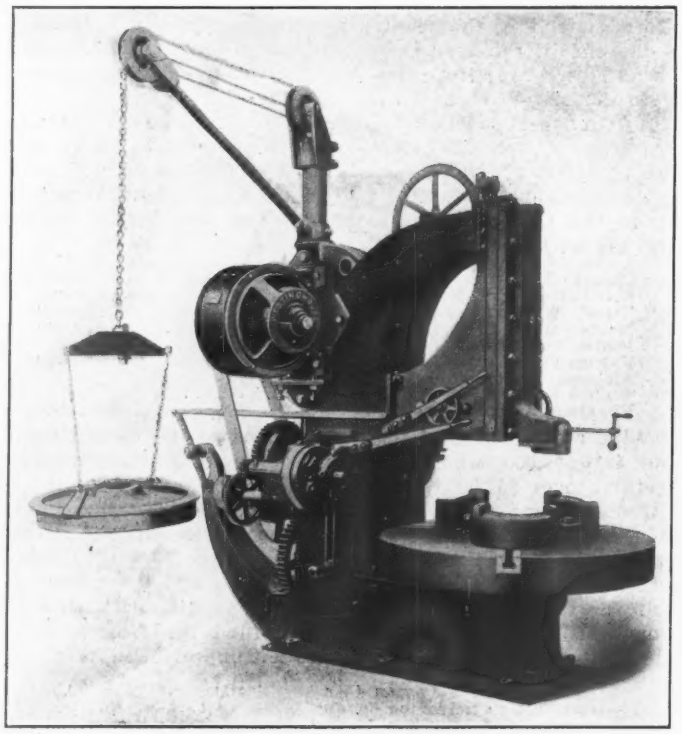
Disastrous Collision Near Melbourne, Australia.

Press despatches of April 20 report a rear collision of passenger trains at Braybrook, eight miles from Melbourne, Australia, on Sunday evening, April 19, in which 42 persons were killed and 80 or more injured. The leading train was just starting from the station. The wreck took fire and three of the cars, with many bodies of victims, were burned up.

Improved Motor Driven Car Wheel Boring Mill.

The illustration shows a motor-driven car wheel-boring mill with improved automatic chuck, friction feed discs and crane attachment. It is a 54-in. machine and its heavy construction and powerful gearing makes it capable of taking the heaviest cuts required for this class of work.

The automatic chuck is self-closing, self-opening and self-centering. It has three adjustable abutments, each provided with an equalizing steel jaw with two bearing points. The work is thus held and centered by six points on the circumference. The first movement of the driving shaft causes the jaws to close in on the



Motor Driven Boring Mill.

work, after which the table begins rotating. When the work is completed, the chuck is released by disengaging the driving clutch and retarding the driving shaft by the friction brake. The inertia of the table and work imparts the force necessary to open the jaws. The work is secured in position in the machine and released with no loss of time and without labor. Since the power of the clutch grip increases with the resistance of the cut, it is never necessary to stop the table to tighten the chuck.

The boring mill is especially arranged for electric drive; the motor is mounted on the vertical housing of the frame. The motor is a Westinghouse, 7½ h.p., type S with a speed variation of about two to one. The mill is made by William Sellers & Co., Inc., Philadelphia, Pa.

Corrugated Round Reinforcing Bars.

The Expanded Metal & Corrugated Bar Co., St. Louis, Mo., announces that, to meet the requirements of those who prefer a round bar for reinforcing purposes, it is prepared to furnish round corrugated steel bars in addition to its present type of squares and flats. The different sizes of these bars have the same net area as the corresponding sizes of plain round bars.

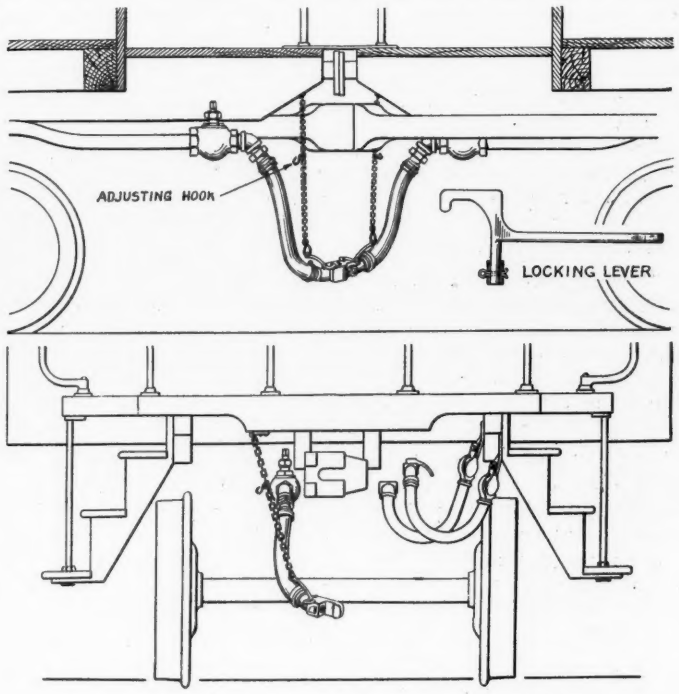
Combination Automatic Lock and Hose Support.

The Gold Car Heating & Lighting Co., New York, has designed a device for automatically locking steam hose couplers and properly supporting the hose and coupler. In this arrangement the hose is relieved of the weight of the couplers both when coupled and when separated, the life of the hose being thus lengthened. Each coupler is supported by a chain from the platform end sill, attached to the long arm of a lever hinged on the coupler. The short arm bears on the mating coupler of the adjacent car in such a manner as to force the gaskets into close contact. This takes all the weight from

Gold Combination Lock and Hose Support.

the hose and presses the gaskets together with a force much greater than that due to their weight and the action of the cam and wedge, which are still retained as integral parts of the coupler. With a coupler weighing 8 lbs. the pressure against the faces of the gaskets in contact is about 200 lbs. Additional pressure can, if desired, be produced by simply increasing the length of the long arm of the lever, but service during the past winter on several railroads has shown that the present proportions are ample for maintaining tight joints.

The locking lever is made of drop forged steel, and while light in construction is amply strong for the work required of it. It can be applied to existing Gold couplers with little or no labor. If the coupler has an eye cast integral with the body, the rocker of the lever is simply passed through this eye and secured with a cotter



Coupling Equipped with Gold Lock and Hose Support.

pin. For those couplers which have no eye, a clamp is provided containing such an eye or fulcrum properly placed. The chain should be of such length as will hold the couplers, when coupled, from 1 to 1½ in. higher than they would be if supported by the hose alone. This chain is provided with an extra hook to be used in case further adjustment be required. The hooking up of the couplers when they are separated is often neglected, causing damage to hose and couplers and sometimes serious accidents to trains. With the use of this device, this is absolutely impossible, as the chain is never detached from the lock, whether the couplers are coupled or uncoupled. In case the train parts, the couplers separate without damage; neither can they drag on the ties.

Ventilation of the Interborough Rapid Transit Subway.

Shortly after the opening of the New York subway it was decided to ventilate the station toilets by some positive means. Small-volume blowers were adopted, and 60 outfits were bought from the American Blower Co., Detroit, Mich. Later, the Rapid Transit Commission decided on a plan for ventilating the subway itself by centrifugal exhausters. "ABC" steel plate exhaust fans were adopted, 25 of which have been installed in vaults (Fig. 1) built in ventilating ducts under the sidewalks along the line of the subway, about midway between stations, from Fulton street to Fifty-ninth street. These exhausters draw the air from the subway, many thousand cubic feet a minute, causing an equal amount of fresh air to flow in at the stations. This action is helped by the plunger effect of the trains themselves forcing the air out through the ventilating ducts. Connection between the ducts and subway is governed by louvers or gills, balanced to open to let the air out, but to automatically close when the air tends to move in the opposite direction. These louvers are shown opened and closed, respectively, in Figs. 2 and 3.

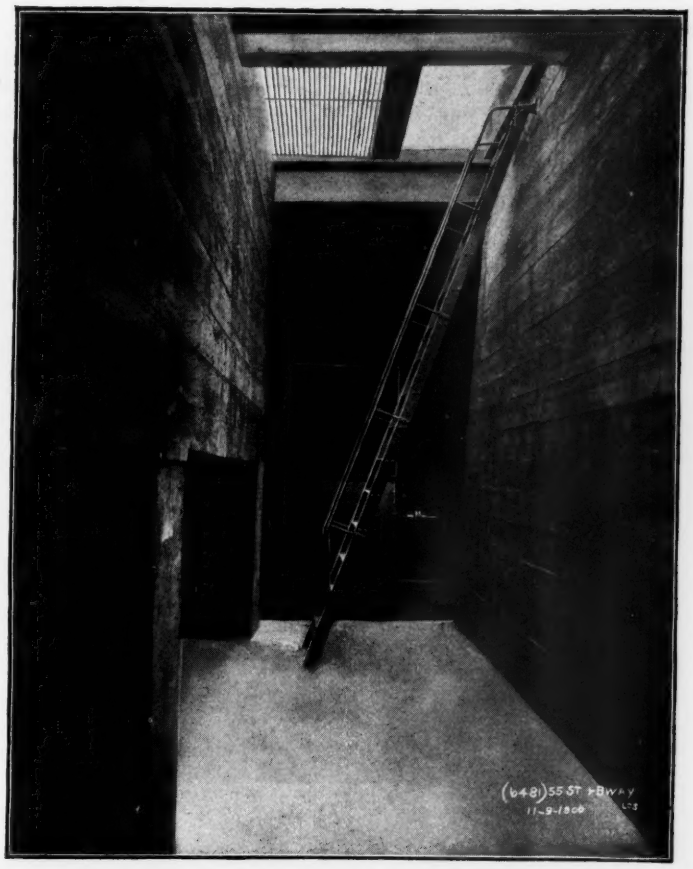


Fig. 1.

Fig. 2.

Independent of the ventilating equipment, a cooling plant has been installed at the Brooklyn Bridge station, using four large "ABC" fans. A view of this installation is shown in Fig. 4.

In the tunnel extension under the East river from the Battery to Brooklyn fresh air is supplied by "ABC" blowers, two being installed at each end of the tunnel. They drive the air in the directions in which the trains run.

These blowers are also used for ventilating the Hudson & Manhattan tunnels between New York and Hoboken and for the Hudson Terminal buildings. Other buildings in New York using these blowers for ventilating are the Singer, the City Investment, the Trinity, the U. S. Realty, the West Street, the Bank of America, the Tribune, the St. Paul, the U. S. Express and the Flatiron buildings; also the Macy, the Wanamaker, the Altman, the McCreery and the Claflin stores; the New York *Press* and the Saks buildings, the Hippodrome, police headquarters, Fordham Hospital, the public baths, and many others.

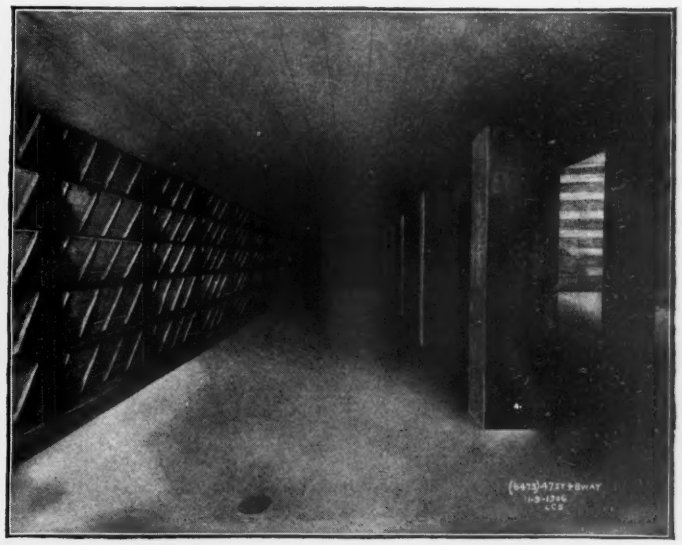


Fig. 3.

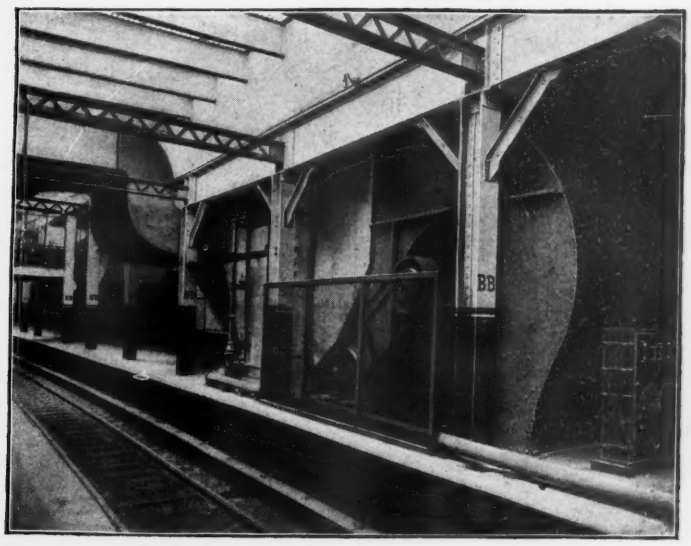


Fig. 4.

A Trip on the South Manchuria Railway.

The following is taken from a recent folder of the South Manchuria Railway. It describes the pleasures and comforts of travel on that railroad:

The locomotives have been supplied by the most popular American Locomotive Co., and the Pullman Car Company has furnished the passenger coaches with the unsurpassed equipments of the Grand American Express. Under the present plan, parlor cars are to be connected with the Grand Express, which are, by the way, sort of observation cars, provided in addition with the comforts of a superior drawing-room, so that the eye being fed on the shifting landscape, the tedium of a journey through wild Manchuria, which must be quite unbearable otherwise, will be reduced to an almost imperceptible burden.

After devoting 17 pages to describing in language and with pictures of various colors, the delights of the line, the following announcement is made:

Before concluding, we are honor bound to inform the public that, prior to finishing the converting work of the line into the broad gage by the summer next year, the second-class accommodation in common vogue in Japan proper will be best at command, no first-class cars with dining equipments being run on the line before that time.

Location of Wheat Areas.

Kansas stands at the head of wheat states in percentage in acreage. The government report of April 1 gives that state 19.1 per cent. of the United States acreage in wheat. Indiana comes next with 8.9 per cent., Illinois with 7.7 per cent., Nebraska with 7.6 per cent., and Missouri with 7.3 per cent. Fully half of the acreage of the winter wheat belt lies beyond the Mississippi, south of Iowa, so completely has the great producing district shifted away from the west. Its first stronghold was in the Susquehanna Valley, then later in the Mohawk, and on the southern shore of Lake Erie. Finally its last stand east of the Mississippi was in the three states of Ohio, Indiana and Illinois, where something less than a quarter of the total winter wheat area is still to be found. Winter wheat is working southward to a warmer climate, while spring wheat is creeping farther north toward the Arctic circle, on the American continent.—*Wall Street Journal.*

INTERSTATE COMMERCE COMMISSION RULINGS.

Rate on Ground Iron Ore Reduced.

In Winter's Metallic Paint Co. v. Atchison, Topeka & Santa Fe et al., opinion by Commissioner Prouty, it was held that a rate of 90 cents per 100 lbs., minimum 60,000 lbs., for transportation of ground iron ore, from Chicago and Chicago points, to Pacific coast terminals, is excessive, and should not exceed 60 cents per 100 lbs.

Old Rate Restored Before Hearing.

The Commission, opinion by Commissioner Cockrell, has announced decision in the case of T. H. Bunch Co. and Merchants Freight Bureau of Little Rock, Ark., v. Chicago, Rock Island & Pacific and eight other railroads. The complainants informed the Commission that their complaint had been satisfied by the carriers by the re-establishment of the rate previously in force. The complaint was therefore dismissed.

Classification of Masurite.

In Masurite Explosive Co. v. Pittsburgh & Lake Erie et al., opinion by Commissioner Prouty, it was held that masurite, which is a high explosive but not dangerous to handle, should be accorded a lower rate than dynamite, the handling of which is attended with great danger. The Commission ordered masurite to be classified as 1½ times first class in Official Classification in less than carloads and second class in carloads, with a minimum weight of 20,000 lbs. to the car.

Demurrage on Private Cars.

The Commission, opinion by Commissioner Lane, has announced its decision "In the Matter of Demurrage Charges on Privately Owned Tank Cars." The conclusion reached is that private cars owned by shippers and hired to carriers on a mileage basis are subject to demurrage when such cars stand on the tracks of the carrier, either at point of origin or destination of shipment, but are not so subject when on either the private track of the owner of the car or the private track of the consignee. The carrier must charge demurrage in all cases where such demurrage is imposed by tariff provision on its own equipment, except when a privately owned car is on a privately owned siding or track, and the carrier is paying, or is responsible for, no rental or other charge on such cars. A privately owned car, in the sense in which that expression is here used, is a car owned and used by an individual, firm, or corporation for the transportation of commodities which they produce or in which they deal.

In expressing this opinion the Commission is not to be regarded as bound thereby, either to the recognition of the right of a carrier to refuse to furnish proper and appropriate facilities for the shipment of oil or any other commodity, or of the right of a carrier to so contract with a shipper for the use of facilities as to permit any discrimination as between shippers or consignees.

Loading Cars to Marked Capacity.

The Commission (opinion by Commissioner Clark) has decided the case of Georgia Rough & Cut Stone Co. v. Georgia Railroad et al. A lower rate on stone paving blocks was made to allow shippers to compete with producers in other states, on condition, which was expressed in the tariff, that the minimum weight should be the marked capacity of the car. Complainant knew the weight of a cubic foot of paving block and always counted the number placed in a car; never specified capacity of car desired, although on request he could have had cars ranging from 40,000 to 100,000 lbs. capacity; always had sufficient material to load to marked capacity of car received, which could have been easily loaded to and beyond that capacity; and from October 1, 1904, to November 30, 1907, found no difficulty in loading to marked capacity of the cars received. The Commission decided that on these facts the regulation making the minimum carload weight the marked capacity of the car was not unjust nor unreasonable, and reparation based thereon was denied. An order was entered dismissing the case; but if complainant and defendants are unable to reach an agreement as to the correct amount of overcharges unlawfully collected from complainant, or if such overcharge is not promptly refunded by defendants, the facts may be brought to the attention of the Commission and the case will, if necessary, be reopened for the entry of such order, or the inauguration of such proceeding as may be warranted.

TRADE CATALOGUES.

Trucks.—A circular issued by the Fairbanks Company, New York, gives the sizes, weights and prices of a number of warehouses and baggage trucks, and other trucks and similar carts for special uses.

Small Motors.—Bulletin No. 4,548, of the General Electric Co., Schenectady, N. Y., illustrates direct and alternating current motors installed for individual motor drive of a large number of machine tools.

Crossing Bells.—Supplement No. 2 to Bulletin No. 24 of the Union Switch & Signal Co., Swissvale, Pa., gives price lists of parts of the Union electric crossing bells, each part being illustrated.

Switch Indicator.—Bulletin No. 4,563, of the General Electric Co., Schenectady, N. Y., describes a switch indicator, type SI-104. This was described in the *Railroad Gazette* of January 3.

Ratchets.—A circular of the Ashcroft Manufacturing Co., New York, describes and illustrates, with sizes and price lists, several styles of Packer ratchets.

Staybolts.—The Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, is sending out a pamphlet on Staybolts, Their Use and Abuse, by John Hickey.

Gages.—A circular issued by the Ashcroft Manufacturing Co., New York, gives sizes and price lists of Scotch gage glasses.

MANUFACTURING AND BUSINESS.

P. H. Griffin has resigned as manager of the New York Car Wheel Co., Buffalo, N. Y.

The New York office of The Curtain Supply Co. has been moved to the Hudson Terminal buildings, 50 Church street.

William E. Moran, of the Moran Bolt and Nut Manufacturing Co., St. Louis, Mo., died Friday, April 10, aged 62 years.

The New York office of the Adams & Westlake Co., Chicago, has been moved to the Hudson Terminal buildings, 30 Church street.

The offices of the American Locomotive Co., New York, have been moved to the Hudson Terminal buildings, 30 Church street.

The New York office of the Duff Manufacturing Co., Allegheny, Pa., has been moved to the Hudson Terminal buildings, 50 Church street.

The Wells Light Manufacturing Co. has moved its main office from 46 Washington street, New York, to 14 Church street, corner Cortlandt street.

W. H. Coweli, formerly Purchasing Agent of the Algoma Central & Hudson Bay, is now with the Wellman-Seaver-Morgan Co., Cincinnati, Ohio.

E. G. Smith, Secretary of the Railroad Supply Manufacturers' Association, moved his headquarters from Chicago to Atlantic City, N. J., on April 20.

W. J. Fauth, formerly Assistant Engineer of the C., B. & Q. Ry., has been appointed Engineer of Sales of the W. K. Kenly Co., Chicago, dealer in rails and track materials.

Wesley Meeteer, 26 Cortlandt street, New York, is asking catalogues and prices on a complete line of machinery and equipment for a car building plant producing both wooden and steel cars.

Samuel M. Curwen, Second Vice-President and General Manager of the J. G. Brill Co., Philadelphia, Pa., has been elected Vice-President and General Manager and also a Director, succeeding, as Vice-President, the late John A. Brill.

The Vulcan Iron Works Co., Toledo, Ohio, hereafter will be

known as The Vulcan Steam Shovel Co. This is to make the corporate name more fully indicative of the principal business of the concern, which is the manufacture of steam shovels.

The executive offices of the Westinghouse Electric & Manufacturing Co., heretofore at 111 Broadway, New York, and the New York sales offices and export offices, heretofore at 11 Pine street, have been moved to the City Investing building, 165 Broadway.

L. W. Horne & Co., New York, Consulting Engineers, announce that capital is being procured for building Boyes mono-rail structures, "scenic railways," at Coney Island and at 110th street and Fifth avenue, New York. It is expected that bids will soon be asked on steel castings and structural steel.

The American Car & Equipment Co., Chicago, announces the association with that company of H. H. Sessions and W. H. Horine. The officers are: H. H. Sessions, President; I. J. Kusel, First Vice-President and General Manager; C. R. Powell, Second Vice-President and General Superintendent; W. H. Horine, Secretary and Treasurer. The directors are: H. H. Sessions, M. A. Garrett, A. R. Warner, I. J. Kusel, C. R. Powell, Phillip Lawrence and S. T. Rowley.

A contract has been given to the Meriden Britannia Co. (International Silver Co., Successor), Meriden, Conn., for all the silverware for the cars, steamships, hotels and restaurants of the Union Pacific, the Oregon Short Line, the Oregon Railroad & Navigation, the Southern Pacific, the Northwestern Pacific, the Illinois Central, the Southern Pacific Company's Atlantic Steamship lines and, probably, the Pacific Mail Steamship Co. The contract runs for several years and is similar to those which the Harriman Lines make with makers of other supplies. At present, the Harriman Lines have 100 dining cars, 50 buffet cars and 50 private cars.

The General Railway Specialty Co., Chicago, H. U. Morton, Vice-President, advises that its metallic sheathing has been applied to a number of passenger coaches of the Chicago & North-Western and Atchison, Topeka & Santa Fe; to 31 baggage cars of the St. Louis & San Francisco, and to 82 Pullman sleeping cars. The Pullman Co. has adopted it as standard for all cars built hereafter. The "National" steel trap-door and lifting device has been applied to 35 coaches of the North-Western, to 15 coaches and three diners building for the C., M. & St. P., and to 10 coaches building for the N. Y., O. & W. "Schroyer" friction curtain rollers have been specified for the 350 street cars building by the Pullman Co. for the Chicago Railways Co., and 300 of this lot will have "National" standard roofing.

The Ajax Manufacturing Co., Cleveland, Ohio, has the following recent orders: from the New York Central, for its West Albany shops, one No. 9 Ajax motor-driven, reversing crosshead bulldozer, and two Ajax belt-driven heading, upsetting and forging machines, ¾ in. and 1 in. respectively; from the Curtis Motor Truck Co., Decatur, Ill., one 4 in. Ajax motor-driven heading, upsetting and forging machine, one No. 8 motor-driven bulldozer with reversing crosshead, and one No. 4 motor driven bulldozer, from the Wyman & Gordon Co., Worcester, Mass., one 5 in. heading, upsetting and forging machine. Shipments have lately been made to the National Tube Co., McKeesport, Pa.; the Mulvey Manufacturing Co., Chicago; the Intercolonial Railway; the Atchison, Topeka & Santa Fe; the Egyptian State Railways, and the Japanese Government.

Iron and Steel.

The McClintic-Marshall Construction Co. has orders for 1 800 tons of bridge material for two viaducts on the Pacific extension of the St. Paul, and for 3,000 tons for track elevation on the Chicago & North-Western.

Orders for rails have been placed by the New York Central Lines as follows: Lake Shore, 20,000 tons; Michigan Central, 14,000 tons (8,000 tons for lines in the United States and 6,000 tons for lines in Canada); Chicago, Indiana & Southern, 2,000 tons; Lake Erie & Western, 1,000 tons, and Boston & Albany, 8,000 tons. These rails are in addition to the 24,000 tons recently ordered for the lines east of Buffalo.

OBITUARY NOTICES.

Henry C. Urner, Secretary and Treasurer of the Little Miami Railroad, and formerly United States Marshall, died on April 18 after a lingering illness. Mr. Urner was 78 years old.

Hall Wilson Watts, Master Car Builder and Car Accountant of the Monongahela Connecting Railroad, and President of the Railway Club of Pittsburgh, died on April 14, after several weeks illness.

John H. Ames, formerly Purchasing Agent at St. Paul, Minn., of the Northern Pacific, died at his home in Ware, Mass., on April 14. Mr. Ames was born in Housatonic, Mass., in 1838. He served throughout the war in the U. S. Navy, retiring in 1865 as assistant engineer. He was Superintendent of the Yale & Towne Manufacturing Co., New York, for 10 years, and later Superintendent of the Grant Locomotive Works, Paterson, N. J. In 1874 he took a consignment of export locomotives to Odessa, Russia. He was made Purchasing Agent of the Northern Pacific in 1879, in which office he served until 1890. He then retired, and had not been actively engaged in business since.

Everitte St. John, formerly Vice-President and General Manager of the Seaboard Air Line, died on April 21 at his home in Wellesley, Mass. Mr. St. John served on the Rock Island for 32 years. He was born in 1844 at Kent, Conn., and began railroad work on the Housatonic Railroad, now part of the New Haven, and in 1862 went west to become clerk in the general ticket office of the Quincy & Toledo, now part of the Wabash. The next year he went to the Chicago & Rock Island, the predecessor of the Chicago, Rock Island & Pacific. In 1864 he was made chief clerk in charge of the general ticket department. In 1869, he was appointed General Ticket and Passenger Agent, and six years later was appointed also Assistant to the General Manager. After a year in these positions, he was made Assistant General Manager, and in 1887 was appointed General Manager. He held this position until 1895. During the Pullman strike in 1894 he was Chairman of the General Managers' Association, representing all the roads entering Chicago. In 1895 he went to the Seaboard Air Line as Vice-President and in 1900 was appointed also General Manager of that road. He retired from railroad service in January, 1901.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

St. Louis Railway Club.

At the annual meeting of this club John J. Baulch (Manufacturers' Railway) was re-elected President; E. F. Kearney (Missouri Pacific) was elected First Vice-President; S. D. Webster (Terminal R. R. Assn.), Second Vice-President, and Charles Waughop, Third Vice-President; B. W. Frauenthal, Secretary, and C. H. Scarritt, Treasurer. The club has 1,148 members, of whom 160 were admitted during the past year. The treasurer reports a balance on hand at the end of the year of $3,968.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Grand Trunk Pacific.—M. M. Reynolds, Fifth Vice-President of the Grand Trunk, has been elected also Third Vice-President of the Grand Trunk Pacific, with headquarters at Montreal, Que. He will have special supervision of the treasury and accounting departments of this road.

Illinois Central.—E. F. Stovall has been appointed General Agent at Birmingham, Ala. He will perform such duties as may be assigned to him in the executive, financial and legal departments, effective April 18.

Long Island.—F. G. Bourne has been elected a Director, succeeding the late Franklin B. Lord.

Mexican International.—P. H. L. King, Assistant Auditor, has been made Auditor of Freight Receipts and his former position has been abolished.

Operating Officers.

Atlantic Coast Line.—After May 1 the road will be operated in three divisions instead of four. The First division will extend from Richmond, Va., to Florence, S. C. This is the same as the present First division. The Second division will extend from Florence, S. C., to Thomasville, Ga., thus merging the present Second and Third divisions. The new Third division will extend from Jacksonville, Fla., to Fort Meyers, taking the place of the present Fourth division. W. H. Newell, General Superintendent of the present First division, will be General Superintendent of the new First division, his headquarters remaining at Rocky Mount, N. C., succeeding C. L. Porter. General Superintendents of the present Third and Fourth divisions will retain their offices in Savannah, Ga., and Jacksonville, Fla., respectively, and act as General Superintendents of the new Second and Third divisions. A. W. Anderson, at present General Superintendent at Florence, S. C., will become General Superintendent of the Charleston & Western Carolina, with headquarters at Augusta, Ga. G. G. Lynch, General Superintendent of the Charleston & Western Carolina, has been appointed Superintendent of the Columbia district First division of the Atlantic Coast Line, with headquarters at Florence, S. C.

Charleston & Western Carolina.—See Atlantic Coast Line.

Erie.—T. B. Duggan has been appointed Trainmaster at Salamanca, N. Y., succeeding W. H. Daley, transferred.

Louisville & Nashville.—J. B. Arbegust, formerly Trainmaster at the Louisville terminals, has been appointed Superintendent of the Louisville terminals, succeeding the late C. J. Klein, and the office of Trainmaster at the Louisville terminals has been discontinued.

Norfolk & Western.—W. J. Jenks, formerly Superintendent of the Seaboard Air Line at Jacksonville, Fla., is now Chairman of the Car Allotment Commission of the Norfolk & Western, with headquarters at Bluefield, W. Va.

Seaboard Air Line.—See Norfolk & Western.

Traffic Officers.

Canadian Pacific.—H. S. Carmichael, Acting General Passenger Agent at London, Eng., has been appointed General Passenger Agent for Great Britain and Europe, with office at Liverpool, Eng. Mr. Carmichael succeeds Mr. Flanagan, who retired some months ago on account of ill health. H. G. Dring will succeed Mr. Carmichael as Assistant General Passenger Agent, with office at London.

Central Vermont.—C. E. Dewey, Assistant General Freight Agent of the Grand Trunk at Montreal, Que., has been appointed General Freight Agent of the Central Vermont, succeeding Robert L. Burnap, transferred.

Grand Trunk.—A. E. Rosevear, freight claim agent at Montreal, Que., has been appointed Assistant General Freight Agent at Montreal, succeeding C. E. Dewey, who has been appointed General Freight Agent of the Central Vermont.

Pennsylvania Lines West.—Guy S. McCabe, division freight agent of the Richmond & Logansport division, has been appointed General Western and Division Freight Agent at Chicago, succeeding M. S. Connelly, promoted.

Engineering and Rolling Stock Officers.

Colorado Southern, New Orleans & Pacific.—B. B. Gordon, Chief Engineer, has resigned, and the position has been abolished. C. H. Fisk, Chief Engineer of Maintenance of Way, with headquarters at Beaumont, Tex., assumes the duties of Mr. Gordon's office.

LOCOMOTIVE BUILDING.

The Iowa Central is said to be in the market for six locomotives. This item is not yet confirmed.

The Lehigh & New England is said to have ordered three locomotives from the Baldwin Locomotive Works, for July delivery. This item has not yet been confirmed.

CAR BUILDING.

The New York City Railway expects to buy 150 pay-as-you-enter cars.

Morris & Co., Chicago, have ordered 200 refrigerator cars from Haskell & Barker.

The American Railway & Lighting Co., Dallas, Tex., is in the market for 10 electric cars.

The Northern Pacific is again figuring on the passenger cars mentioned in the *Railroad Gazette* of March 13.

The Northern Pacific has ordered from the American Car & Foundry Co. the 500 refrigerator cars mentioned in the *Railroad Gazette* of April 17.

The Chicago & North-Western has ordered 300 steel ore cars of 100,000 lbs. capacity from the Pullman Co. and 250 from the American Car & Foundry Co.

The Lehigh & New England is said to have ordered 50 gondolas from the Cambria Steel Co. in addition to the 250 forty-ton cars mentioned in the *Railroad Gazette* of April 3. This additional item has not yet been confirmed.

The Minneapolis & St. Louis has been figuring on two combination mail and express cars. These cars will be 70 ft. long and 9 ft. wide, inside, and 6 ft. 9½ in. high to top of plate. Platforms are to be equipped with the National centering device, and the cars are to have a 40-ft. mail compartment with two doors on each side and equipped with Harrison postal bag racks. The special equipment will include:

Brake-beams	Simplex
Brake-shoes	Cast-iron—Christy brake heads
Couplers	Tower
Draft rigging	Harvey tandem draw-bar spring—Miner draft lug
Journal boxes	Symington
Light	Pintsch gas and oil
Platforms	Am. Car & F'dry Co. standard I-beam construction
Springs	Crucible steel
Vestibules	Pullman dummy
Wheels	Davis solid steel

RAILROAD STRUCTURES.

Barrie, Ont.—An agreement, it is said, has been reached between the city authorities and the Grand Trunk, under which the road will build new shops here. The work is to be finished within three years.

Hainsburg Junction, N. J.—The Lehigh & New England, it is said, has given a contract to the Pennsylvania Steel Co. for a 155-ft. bridge over Paulins Kill.

New Westminster, B. C.—The Victoria Terminal Railroad & Ferry Co. is applying for permission to build steel bridges across Serpentine and Nicomeki rivers, near this city.

Portland, Pa.—The Lehigh & New England is said to have given a contract to the Pennsylvania Steel Co. for a bridge over the Delaware river. The river spans will be 925 ft. long, and the viaduct approach, 934 ft.

Rensselaer, N. Y.—It is said that the Boston & Albany will at once start work on a roundhouse here.

Temiskaming & Northern Ontario.—Bids are wanted by A. J. McGee, Secretary and Treasurer, Toronto, Ont., May 7, for some station buildings, also other structures and a number of small concrete arches.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Arkansas Roads.—Surveys are reported made for a line from Mountain Home, Ark., south to a connection with the St. Louis, Iron Mountain & Southern, 11 miles. W. L. Marshall, of Mountain Home, is the principal promoter.

Bainbridge Northeastern.—This company, organized last year to build a line from Bainbridge, Ga., northeast to Pelham, 35 miles, and eventually south through Florida to a point on the Gulf coast. has finished 18 miles of its proposed line, and has material for building three miles additional. (Sept. 20, p. 338.)

Buffalo & Lake Erie Traction.—Bonds have recently been issued by this company to build a five-mile extension in Mill Creek township, Pa.

Canadian Northern.—The Provincial Government of Ontario has undertaken to guarantee the bonds of this company to provide for the construction of 50 miles of new railroad at $20,000 a mile, and of terminals in Toronto to the amount of $1,500,000.

Canadian Pacific.—The company has decided not to proceed with the construction of the Moosejaw extension this spring, as was previously intended.

Canadian Valley (Electric).—An officer writes that the projected route of this line is from Fort Supply, Woodward county, Okla., southeast down the Canadian river to Oklahoma City, 150 miles. Thomas Martin, President, Mutual, Okla. (March 27, p. 461.)

Cananea, Yaqui River & Pacific.—See Southern Pacific.

Chicago, Milwaukee & Gary.—Bonds have recently been issued by this company to build an extension from Momence, Ill., north to Gary, 42 miles. Surveys made and rights of way being secured. Also to build from the northern terminus at Rockford, northeast through Beloit, Wis., and Janesville, to Milwaukee, 100 miles, and to secure large terminals at Gary and at Milwaukee. This company owns the railroad and property of the Illinois, Iowa & Minnesota, operating 125 miles of railroad from Momence, Ill., northwest to Rockford, and when the extensions and improvements are made will have a total length of 267 miles. It will form a complete belt line around Chicago, connecting with all of the 32 railroads entering that city. (March 20, p. 429.)

Grand Trunk Pacific.—According to a report recently made to the Dominion Parliament, the estimated cost of this line is now $85,000,000. On the eastern division, Moncton, N. B., to Winnipeg, work amounting to $44,389,393 is under contract, and $19,030,173 is the estimated cost of lines for which contracts are yet to be let on this section. The Prairie section is to cost $21,872,200. From a point 193 miles west of Quebec, west to Winnipeg, the surveyed distance is 1,147 miles, of which 571 miles is already let, leaving 576 miles not yet under contract. West of Winnipeg lines aggregating 1,014 miles are under contract, of which 415 miles is finished.

Hon. George P. Graham, Canadian Minister of Railways, recently stated that contracts have been let for all sections between Moncton, N. B., the eastern terminus, and a point known as Waymontachene, 193 miles west of Quebec.

Track laying, it is said, has been started from the terminus of the present track, four miles east of Portage la Prairie, Man., where a bridge is to be built over the Assiniboine river east to Winnipeg. It is expected to have all the track laid on this section

by the middle of May, and that the line will be in operation between Fort William and Edmonton, Alb., this fall.

Contracts for grading the sections from Macleod river, Alb., west 100 miles, are to be let May 15, and for the next 80 miles on June 22. This 180 miles, in addition to the 120 miles now being graded, will carry the line through Yellowhead Pass in the Rocky Mountains. (April 17, p. 559.)

Foley, Welch & Stewart, who have the contract for the first 100 miles from Prince Rupert, B. C., east, have sublet one mile through solid rock at Prince Rupert to Ross & Carlson.

An extension of time of two years has been granted to the Grand Trunk Pacific Branch Lines Co. for the following branches from the main line of the Grand Trunk Pacific: Belt line around the city of Winnipeg, Man., to connect with the other railroads, and passing, if deemed advisable, through the outlying portions of that city. Winnipeg, Man., to a point on the international boundary within a distance of 25 miles east or west of the Red river. Neepawa, Man., to a junction with the Grand Trunk Pacific to Brandon and from thence to Regina, Sask. Line from Brandon to a point on the southern boundary of the province in the vicinity of Turtle mountains. From a point on the western division in the vicinity of township 22, range 6, west of the second meridian, to Yorkton, Sask, and from thence to a port on Hudson's Bay. From the same point as the above branch southward to Regina, Sask., and thence to the international boundary near North Portal. From a point on the western division between 105th and 107th degrees of longitude to Prince Albert, Sask. From a point on the western division between 108th and 109th degrees of longitude to Prince Albert, Sask. From a point on the western division between 111th and 113th degrees of longitude to Calgary, Alb., and from thence to the international boundary near Coutts, Alb. From Vancouver, B. C., to a junction with the Grand Trunk Pacific or to a junction with the Pacific Northern & Omineca, or both between the 122d and 124th degrees of longitude. From a point on the north shore of Vancouver Island southerly to Victoria, B. C. From a point on the western division between 127th and 129th degrees of longitude to Dawson City, Y. T.

GRAND VALLEY (ELECTRIC).—It is said that this company, operating 21½ miles of electric lines connecting Brantford, Ont.; Paris, Glen Morris and Galt, will build an extension to Port Dover, 35 miles; also an extension to Woodstock, 18 miles.

KENTUCKY NORTH & SOUTH.—Projected from Greenup, Ky., south to Bristol, Tenn., 220 miles. Surveys reported made from Greenup to Palm Gap, 180 miles. L. E. Niles, President; T. J. Kirkpatrick, Treasurer, and E. E. Parsons, Chief Engineer, all of Springfield, Ohio. The office of the company is at Covington, Ky.

LAKE ERIE & YOUNGSTOWN (ELECTRIC).—This company, incorporated to build an electric line from Conneaut, Ohio, south to Youngstown, about 60 miles, recently increased its capital from $10,000 to $3,500,000. J. H. Ruhman, of Youngstown, who is promoting the enterprise, is quoted as saying that 75 per cent. of the right of way is secured, and that construction work is to be started as soon as the remaining 25 per cent. has been obtained. The increased capital is to prepare for this work. (Aug. 30, p. 247.)

LARAMIE, HAHN'S PEAK & PACIFIC.—Additional grading contracts are reported let to J. F. White & Co., of Rock River, who previously had contracts for some of the work on the extension building from Centennial, Wyo., south to Hebron, Colo., 77 miles. Contract is also reported let to Peter Cain for some of the work. (March 13, p. 392.)

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—Thomas Green, Chief Engineer of this road, is quoted as saying that about $6,000,000 is to be spent this year on extension and improvements, including a tunnel into the city of St. Paul, Minn., from Minneapolis. The company has work under way on an extension from Brooten, Minn., northeast to Duluth, 189 miles, of which 49.6 miles was built in 1907. At the Duluth end about 500 men are at work. Foley, Welch & Stewart, of St. Paul, contractors. (March 13, p. 392.)

MEXICAN CENTRAL.—According to reports from Mexico City, work has been suspended on the Tampico cut-off, building from Mexico City east to Tampico. This line is 304 miles long and about 191 miles remains to be built. (March 13, p. 396.)

This company, it is said, will begin work this summer on widening the gage and reconstructing the line from Colima to the Port of Manzanillo. (March 13, p. 396.)

MEXICAN PACIFIC COAST.—See Southern Pacific.

MEXICAN ROADS.—Permission has been given by the Mexican Government to Carlos A. Hamilton, of Oaxaca, to transfer the concession granted to him, to a company to be organized in Oaxaca. It is to build a line from San Pablo, Huitepec, in the district of Zimatlin, Oaxaca, to San Juan Taviche, Ocotlan. An extension of two years' time to finish the work has also been granted.

Contract, it is said, will shortly be let by Percy N. Furber, of Mexico City, President of the Oil Fields of Mexico Company, to build a line from its works at Furbero, Vera Cruz, to the port of Tuxpan, 50 miles. Contract also to be let for the construction of an oil pipe line parallel to the proposed railroad.

PANHANDLE SHORT LINE.—This company was organized last year to build from Dalhart, Tex., south via Hereford and Midland, to San Antonio, also to Rockport, on the Gulf, with branches, a total of about 800 miles. According to statements credited to W. A. Squires, of Henrietta, Tex., General Manager, the work is to be pushed. The section from Carrizo Springs southeast to Artesia is being built by Asher Richardson. Grading south from Stanton has been finished for 22 miles, and north from Stanton for 24 miles; also from Dimmit, north to Hereford, 22 miles. Contracts are to be given to Suderman, Dolson & Co. for grading from Artesia east to Rockport; to Harris & Co. from Uvalde to Crystal City, and to the Southwest Texas Construction Co., north from Hereford. (March 13, p. 393.)

PENNSYLVANIA ROADS (ELECTRIC).—Horace Snyder, of Pittsburgh, is organizing a company to build an electric line from Franklin, Pa., north via Wyattville, Bradleytown and Townville, to Cambridge Springs, 36 miles.

PLEASANTVILLE ELECTRIC TRACTION.—Organized in Pennsylvania to build an electric line from Oil City, Pa., north via Rouseville, Pit Hole and Pleasantville to Titusville, 12 miles. The promoters are residents of Oil City and Pleasantville.

SOUTHERN PACIFIC.—J. Kruttschnitt, Vice-President, is quoted as saying that work on the Mexican Pacific Coast building from Navajo, Sonora, south of Coral on the Cananea, Yaqui River & Pacific, southeast to Guadalajara, Jalisco, is finished to Macerita river, about 270 miles south of Guaymas. About 15 miles additional is graded, and track laying is soon to be started on this section. It is expected to have the line finished as far as Culican early in July.

The Grant Bros. Construction Co., of Los Angeles, Cal., building the branch of the Cananea, Yaqui River & Pacific, from Rio Yaqui, Sonora, north to Nacozari, 108 miles, has a large number of men at work, said to be about 1,000. (March 13, p. 396.)

YOUGHIOGHENY & CHEAT RIVER.—Incorporated in Pennsylvania with $200,000 capital, to build a line from Ohio Pyle, Pa., where connection is to be made with the Baltimore & Ohio, south 21 miles to the West Virginia state line. Contracts, it is said, are to be let at once. A charter is to be asked for in West Virginia to extend the line south to a point in Preston county. E. W. Mudge, President, Pittsburgh, Pa. J. V. Thompson, A. L. Keister and A. Overholt are said to be interested.

RAILROAD CORPORATION NEWS.

BAINBRIDGE & NORTHEASTERN.—J. M. Wilkinson, as receiver of E. Swindell & Co., has taken entire charge of all the property of the Bainbridge Northeastern Railroad.

BALTIMORE & OHIO.—Commencing May 1, the Little Kanawha Railroad, which runs from Parkersburg, W. Va., to Owensport, 31 miles, from Owensport to Enterprise, three miles by steamer, and from Enterprise to Creston, 16 miles, will be operated by the Baltimore & Ohio. The Little Kanawha Railroad is owned jointly by the Pittsburgh & Lake Erie, the Baltimore & Ohio and the Pennsylvania, through the Little Kanawha syndicate.

Gross earnings for March were $5,300,000, a decrease of $1,200,000 from March, 1907. Net earnings were $1,150,000 for March, a decrease of $469,000 from March, 1907.

BOSTON & MAINE.—A syndicate of six banking houses composed of R. L. Day & Co.; Lee, Higginson & Co.; Kidder, Peabody & Co.; Estabrook & Co.; Blodget & Co., and Merritt & Co., are offering $2,400,000 Fitchburg Railroad 4½ per cent. 20-year bonds at 103½ to yield 4¼ per cent. The bonds were sold by the road to provide funds to take care of $2,000,000 bonds maturing the first of next month. The balance, $400,000, will be used to reimburse the Boston & Maine for construction money already spent on the Fitchburg.

BUFFALO, ROCHESTER & PITTSBURG.—Gross earnings for the second week in April were $115,000, a decrease of $52,000 from the second week in April, 1907.

CHESAPEAKE & OHIO.—This company will probably sell in the near future $2,000,000 5 per cent. consolidated mortgage bonds of 1889-1939, to meet an equal amount of 6 per cent. mortgage bonds which fall due on July 1. The new bonds are part of an authorized issue of $30,000,000, of which there are outstanding $25,858,000. The company also has $1,200,000 6 per cent. notes falling due on June 28. It is proposed to meet these by issuing new notes.

CHICAGO, INDIANA & SOUTHERN.—J. P. Morgan & Co. are offering at 91 and interest, $15,150,000 of the Chicago, Indiana & Southern's $20,000,000 (authorized) 50-year 4 per cent. mort-

gage bonds, 1906-1956, guaranteed by the Lake Shore & Michigan Southern. These bonds are a first lien on 329 miles of road and equipment, except that there are outstanding $4,850,000 bonds of 1901-1950 of the Indiana, Illinois & Iowa, which are a first mortgage on the Kankakee division only, and to provide for which bonds of the new issue are reserved. On December 31, 1907, there were $7,000,000 Chicago, Indiana & Southern bonds in the treasury of the Lake Shore.

Chicago, Milwaukee & Gary.—This company has authorized $20,000,000 40-year 5 per cent first mortgage bonds. Of these $5,500,000 have been issued in exchange for the Illinois, Iowa & Minnesota Railway and its subsidiary lines, which operates 125 miles. The balance of the bonds will be issued to pay for extensions south to Gary and north to Milwaukee, and for terminals at Gary and at Milwaukee.

Chicago, Milwaukee & St. Paul.—The Milwaukee Terminal Railway was incorporated in the state of Washington last week, to act as a common carrier and to supply facilities for handling freight and passengers at railroad terminals.

Erie.—Gross earnings for February were $3,200,000, a decrease of $500,000 from February, 1907. Net earnings for February were $196,000, a decrease of $516,000 from February, 1907.

Fitchburg Railroad.—See Boston & Maine.

Galveston Terminal Railway.—The stockholders have authorized $5,000,000 bonds to pay for improvements now under way. The company's facilities are to be used by the Trinity & Brazos Valley, the Colorado & Southern, the Chicago, Rock Island & Pacific, and the St. Louis & San Francisco.

Great Northern.—It is said that the Northern Pacific is to give the Great Northern an entrance to Tacoma, Wash., and in return get an entrance into Vancouver, B. C., from the Great Northern.

Gulf & Ship Island.—The $460,000 car trust certificates offered in January, 1908, by Cramp, Mitchell & Shober, of Philadelphia, were never issued, owing to a change in plans.

Illinois Central.—A first lien equipment mortgage for $30,000,000 has been filed for record by this company. The mortgage is to secure an issue of 4 per cent. bonds 1908-1923. The mortgage covers the entire rolling stock of the company.

Interborough Rapid Transit.—The New York City Public Service Commission has authorized a mortgage securing $55,000,000 45-year bonds, of which $35,000,000 5 per cent. bonds are to be deposited as security for $25,000,000 three-year 6 per cent. notes, dated May 1, 1908. It is said that these notes have been sold to J. P. Morgan & Co. The proceeds of the sale will enable the company to redeem the $15,000,000 4 per cent. notes due May 1, 1908, and to pay off other obligations.

International & Great Northern.—Steps have been taken to foreclose the company's second mortgage. This is the Texas Railroad which several months ago was placed in the hands of a receiver.

Gross earnings for the week ended April 14 were $118,000, a decrease of $35,000 from the corresponding week in 1907.

Lake Shore & Michigan Southern.—See Chicago, Indiana & Southern; also Lehigh Valley.

Lehigh Valley.—The Lake Shore & Michigan Southern has already disposed of approximately 50,000 shares of its Lehigh Valley stock. (April 17, p. 560.)

Little Kanawha.—See Baltimore & Ohio.

Metropolitan Street Railway.—See New York City Railway.

Mexican Central.—See National Railways of Mexico.

National Railways of Mexico.—S. M. Felton, President of the Mexican Central, in discussing the Mexican Railroad merger, said that it does not mean a government ownership, but a control which is most desirable. The conditions there are entirely different from those in the United States. Mexico is undeveloped, and what it needs most is railroads. Through a government control railroad construction will be carried on so as to benefit the country as a whole, and thus avoid needless parallel lines and unnecessary expenditure for the purpose of competition.

New England Investment & Security Co.—See New York, New Haven & Hartford.

New York Central & Hudson River.—The Public Service Commission, Second District, has authorized the New York Central to issue $4,000,000 3½ per cent. refunding mortgage bonds of 1897-1997. There are outstanding $85,000,000 of a total authorized issue of $100,000,000. It also authorized the issue of $20,000,000 4 per cent. debenture bonds of 1904-1934. The total authorized issue of these bonds is $50,000,000, of which $30,000,000 are now outstanding. The proceeds of the bond sales are to be used for improvements.

New York Central Lines.—See Baltimore & Ohio.

New York City Railway.—Judge Lacombe, of the United States Circuit Court, has filed a memorandum in which he states that the New York City Railway Co. should be held liable for the $3,500,000 which is needed to put the property of the Metropolitan Street Railway in good condition. The New York City Railway Co. is the lessee of the Metropolitan Street Railway.

New York Connecting.—Ralph Peters and John F. Stevens have been elected directors to succeed Thomas B. Rea and Charles S. Mellen, respectively. Other directors have been re-elected.

New York, New Haven & Hartford.—Mackay & Co., of New York, are offering at 81½, to yield 4.85 per cent., a small amount of the New England Investment & Security Co.'s cumulative preferred stock, which is guaranteed by the New York, New Haven & Hartford.

Northern Pacific.—See Great Northern.

Paterson Railway (Electric).—F. K. McCully, of Paterson, N. J., and W. E. R. Smith & Co., of New York, are offering $202,000 6 per cent. consolidated mortgage bonds of the Paterson Railway Co. at 116½, yielding 4.80 per cent. These bonds will, after June 1, 1908, be a first mortgage on 39 miles of street railway in Paterson, N. J.

Pennsylvania.—This company has sold to Kuhn, Loeb & Co., New York, and N. M. Rothschild & Co., and Baring Bros. & Co., Ltd., of London, $40,000,000 of its 40-year, 4 per cent. consolidated mortgage bonds, which is part of an authorized issue of $100,000,000 of 1873. There are now outstanding $12,500.000 of these consolidated mortgage bonds. These bonds are a first lien on all the main line and branches of the Pennsylvania Railroad between Pittsburgh and Philadelphia, subject only to $20,000,000 general mortgage bonds now issued, which mature in 1910 and which will be refunded by an issue of the consolidated mortgage bonds first mentioned. The new bonds also cover the lease of the United New Jersey Railroad & Canal Co., which forms the main line of the Pennsylvania from Philadelphia to Jersey City. Incidentally this is the first time in about 30 years that the Rothschilds have handled an American security. It is understood that the bonds will be issued at 96.

See Baltimore & Ohio.

Pittsburgh & Lake Erie.—See Baltimore & Ohio.

Pittsburgh, Cincinnati, Chicago & St. Louis.—Gross earnings decreased during March more than operating expenses and taxes, so that the net earnings after taxes were $30,000 less than in March, 1907.

Texas & Pacific.—Gross earnings for the week ended April 14, 1908, were $212,000, a decrease of $76,000 from 1907.

Underground Electric Railways of London.—The directors have sent out circulars to the noteholders and shareholders giving them details of the reorganization plan. A receiver was appointed for the Underground Electric Railways of London on April 15. Under the plan of readjustment the holders of $35,000,000 5 per cent. profit sharing notes due June 1, 1908, will be given in exchange 40 per cent. in new 4½ per cent. bonds due 1933, and 70 per cent. in new 6 per cent. income bonds due 1948. No assessment is asked for from stockholders. Of the 4½ per cent. bonds there are to be issued $15,000,000 (£3,000,000), and of the income bonds there are to be issued $26,000,000 (£5,200,000). There are also to be sold to Speyer & Co. $5,500,000 (£1,100,000) prior lien 12-year 5 per cent. bonds to meet the cash requirements of the company. Speyer & Co. agree to provide $1,500,000 (£300,000), for any possible deficiency in fixed charges during the next few years "in order that the noteholders may not suffer so serious a reduction in their income as might otherwise be the case during the further developments of the enterprise." The three issues of bonds will be secured by a deposit of $17,500,000 (£3,500,000) par value of the Tube shares and the equity in the power house in addition to $55,000,000 (£11,000,000) par value of the stocks now held by the London and Westminster Bank as trustee for the noteholders, the prior lien bonds ranking before the other issues.

United States Express.—A semi-annual dividend of $2 per share has been declared. This is a reduction of $1 per share from the dividend declared six months ago. Prior to that time $2 per share had been paid semi-annually.

Wabash.—The company has sold to Tailer & Company, New York, $889,000 first mortgage, 5 per cent. bonds, 1889-1939. With the sale of these bonds, the total authorized issue $34,000,000 is outstanding. Tailer & Company are offering these bonds to yield 4 70/100 per cent.